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AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

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Directions for bending, blowing, and cutting of Glass, for chemical and other purposes. Extracted from Chemical Manipulation. By Michael Faraday, F. R. S.

[Continued from p. 150.]

37. The information given relative to glass-blowing, will enable the student to make much of the apparatus already referred to. Tube retorts are made, by first closing the end of a piece of tube, and then the parts representing the body and the neck, are to be separated by a bend more or less sharp, according to the intended application of the vessel. In the same manner are the tubes necessary for the condensation of gases, to be made. Syphons are made merely by bending glass tube; or, if their apertures are to be contracted, the proceeding is the same as that necessary in the first part of the process for closing a tube, (30) the operation being carried no farther than to lessen the diameter: that done, the glass is to be allowed to cool, and the narrow part is then to be cut by a file. (19)

38. If when the glass tube is heated all round and much softened, the parts be pulled asunder quickly, and not in the guarded manner already advised, then, instead of a mere contraction of a small portion of the tube to two-thirds or one-half its first diameter, it will become extended and capillary; and the two portions of the tube held by the fingers, thus connected, will be found to contract in diameter for the space of half an inch, or an inch, gradually becoming capillary. This operation is frequently useful in the preparation of capillary tubes for various purposes, as in the contraction and elongation of the ends of glass retorts, or other similar apparatus; and in making tube funnels, syringes, &c. It should always be performed in the

air, and not in the flame of the lamp, unless the operator be very expert: when the glass, therefore, is heated, it is to be removed from the flame and drawn out. The greater the heated portion of glass, the longer will be the tube. Its length and fineness also increase with the rapidity with which it is drawn, and with the temperature given to it in the first instance. The velocity with which the hands should separate, is most generally, at the rate of about a foot in a second. The thickness, length, and general character of the capillary tube produced, is, also, considerably dependant on the kind of tube out of which it is made: the relation of the diameter to the thickness of the glass, will be nearly the same in the tube, both before and after it is drawn out.

39. When a contracted tube is required, and too long to be made at once, then having drawn one length, the original tube is again to be heated so near to the part already drawn, that when extended, only a little swelling or bulb may intervene between the capillary portions. It is not safe to endeavour to heat the tube so near to the already extended part, as, on drawing it out, to make one tube with the latter, without irregularity, for, owing to its delicacy, the previously extended part will almost certainly give way: no difficulty occurs in afterwards softening and drawing down the small expansions; for by making use of a little spirit-lamp flame, placed under the bulbs, they are soon raised to a red heat, and then by careful management are easily drawn down.

40. When the ends of retorts or other tube apparatus are to be thus reduced in diameter, they should not be drawn out more than is necessary, but left with sufficient strength to resist the slight mechanical accidents to which they are liable in the course of experiments. The same remark applies to such vessels as the small receivers or retainers, recommended. If the neck of the retort, or tube, to be drawn out be thin, it is for the same reason advantageous to thicken the part before it is extended, (35) for which purpose the glass must be softened in the flame, and retained at a high temperature for some time, and rather thrust together than pulled out; in this manner the thickness of the glass may be nearly doubled, and, consequently, the capillary tube resulting from its linear extension, rendered stronger.

41. When capillary tubes are drawn for air-gauges, several should be made of different diameters, thicknesses, and lengths, and the most advantageous afterwards selected.

42. The same proceeding, with slight variations, is sufficient for the production of several kinds of useful apparatus. A tube funnel is made by elongating a piece of tube in this manner, at about an inch from the end, and then separating it, leaving the short piece with so much of the capillary tube attached to it, as will form a funnel of sufficient length. Tube syringes of various kinds, for the removal of azotane, washing of precipitates, &c. are made with equal facility. When the end of a piece of tube is heated and drawn out, a form more or less acute may be given to the termination, which, being cut so as to leave an aperture of the proper size, is only to be

held for a moment in the flame to soften and obliterate the edges, (20) and a very good syringe body is formed. A little tow, wrapped round the end of a wire, and moistened, forms an effectual piston, and thus an instrument of great use in numerous operations, is quickly made. If it be required that the termination of the syringe should pass off obliquely, it is effected by drawing out the tube in that direction when hot.

43. It is very frequently necessary with tube apparatus, to seal apertures hermetically, so as entirely to close the vessel, and make it continuous in every part. This process resembles that by which one end of an open tube is sealed, (36) so far as regards softening the glass, bringing it together, contracting the aperture, and, ultimately, closing it; but it differs very much in other circumstances, dependant upon the state of the interior of the vessel. In the open tube, the glass is equally pressed on both sides; but that is rarely the case in the closed tube, a tendency of the contents to pass outwards, or of the air inwards, almost always occurring.

44. The simplest case of the kind is, where solid fixed matter is to be confined in a tube for the purpose of preserving it. The included substance then sends off no vapour, and all that is to be guarded against, is, the expansion and contraction of the air within, by the variations of heat. Suppose the tube closed at one extremity, and that one-half or two-thirds of it is filled with the substance; care should be taken that the latter does not rise so near to the upper part of the tube as to be affected by the heat, especially if it be an easily fusible or changeable body. The top of the tube when brought towards the flame, should be inclined, (36) that the products of the combustion may not enter it; and the bottom should be inclined downwards, that the contents may not fall towards the heated part. The upper part, being heated, should be drawn out and contracted, precisely as if it were the end of an open tube that was to be closed, except that the glass generally should be retained as thick (35) as it will be required when finished, in order that the capillary tube may be of considerable comparative thickness, and that an aperture for the air through the middle of it may be preserved the whole time. The wood-cut will illustrate this state of the tube. No difficulty will be found in directing the heat about *a*, in drawing off the end piece, and in leaving the tube sealed, for the glass will readily coalesce at the moment of separation; but the object is, to make this end as strong as any other part of the tube, and of a form similar to that of the opposite extremity; for effecting this, the following explanations and precautions will be found useful.

45. Supposing the piece drawn off and the end closed; the glass is so hot and soft at the moment, that, if from an accidental contact of the flame, any part of the tube become hotter than before, the air within will expand, the glass will be blown out into a thin bubble, which, breaking even by the mere pressure of the atmosphere as the tube cools, will leave a large hole. It will now be more difficult to

close the tube than before the extremity was removed, for the sides of the aperture must again be collected together and drawn off, and a capillary neck again formed.

This may be avoided by purposely heating the upper part of the tube before sealing it hermetically, so as to expand and expel the air from within; then, removing the flame and applying it to the capillary neck as the general temperature of the tube sinks, the piece is to be drawn off, and the aperture sealed, and as the pressure is inwards, rather than outwards, the glass will be pressed in the former direction. This is, in fact, the method to seal the tube strongly, and to make it of a desirable shape, but it is subject to an accident, which to be avoided must be known. If the glass at the end has been left thin, and it be heated until perfectly soft, the pressure of the external air will frequently force it inwards, sometimes into a decided bubble, or sometimes into various wrinkled and irregular forms, which, when cold, are almost sure to crack in numerous directions.

These accidents are avoided by making the end of the glass and the capillary neck of considerable comparative thickness, which is done by allowing the glass to gather itself up when in a fluid state, (35, 40) and also when warming the tube to expel a part of the air, by not raising the temperature too much; then, upon proceeding to soften the neck and seal the extremity, the flame should be directed rather generally to that end of the tube in such a manner that, the whole being softened, the apex shall still be retained at the highest temperature. In this way it will be easy, by a little practice, to make the external pressure effectual in forcing in the end of the glass generally, and causing it to become altogether thicker and stronger, instead of having a small portion suddenly blown inwards, and the whole rendered irregular. Or if, by too long a continuance of heat, the air within begins to expand, still, as all the glass at the end is of equal softness, the whole will gradually enlarge outwards; an effect which will be immediately perceived, and the operation may be stopped before any injury is occasioned.

46. When the tube contains a fluid instead of a solid body, the care required is greater, and must be proportionate to the volatility of the substance. A fixed fluid, if alone, merely requires to be retained in the lower and colder part of the tube, away from the end to be sealed. Sudden motion should be avoided, lest drops be thrown upon the heated part, and cracks be occasioned: during cooling, the tube should also be placed steadily with its heated end uppermost. There are particular cases, in which great care is necessary, to prevent disturbance of the contents of the tube. Such are the experiments upon the condensation of gases, in which the strength, uniformity, and annealed state of the end hermetically sealed, are essentially necessary.

47. If the substances to be confined are volatile, but yet, like alcohol, ether, chloride of sulphur, &c. have their boiling points not lower than 100° or 150°, then additional precautions will be needful: these apply particularly to the moment when the capillary neck is to be finally drawn off and closed, and the end thickened and made

strong. The effect of heat upon tubes with such contents, is not only to expand the air within them, but also to increase its bulk, by raising and mixing with it the vapour of the substance. The formation of this vapour, and, consequently, the tendency of the gaseous matter within to expand, is not simply in proportion to the heat of the end of the glass tube with which the vapour is in contact, but depends also upon the heat communicated to the fluid beneath. This effect is produced more slowly than the former, and may, in the hands of an inexperienced person, lead to confusion. The temperature of the glass near the end may be actually falling, and may lead to the expectation of a diminution in bulk of the gaseous or vaporous matter within, and, consequently, of a pressure from without, inwards, whilst, at the same time, the temperature of the fluid may be rising by *contact* with the neighbouring hot or warm glass, and may cause an increase in the quantity of vapour given off, and upon the whole, a tendency of gaseous matter to pass out of the tube; which, not being anticipated, would spoil an experiment. In these cases, the upper part of the glass (45) should be heated so as to expand the gaseous contents a little, and at the moment the capillary neck is drawn off, and the aperture closed, a piece of moistened bibulous paper should be applied round the part of the tube containing the fluid, and if the substance be very volatile, even a little higher up, though not to the heated part of the glass. This will prevent any further elevation of temperature in the fluid, and the end may be safely heated and thickened, (45) in the manner already described for tubes containing solid bodies.

48. When the aperture to be sealed is small, and at the end of a capillary tube, nothing more is required than to hold it in the flame of a lamp or candle, when the glass will fuse and coalesce. Or if the end be broken and rather wide, the part softened by heat should be touched with another piece of glass, and be drawn out and sealed as before. In these cases when sealed, the glass is to be removed from the flame, not being suffered to run into a little ball, which will generally break off when cold, or after an interval of three or four days.

49. When substances so volatile as to boil almost at common temperatures are to be sealed up, the tubes containing them must be cooled by refrigerating mixtures. If the fluids are to be preserved as specimens, the capillary neck should be of considerable thickness, and when effectually sealed, whilst the tube is in the frigorific mixture, should not afterwards be altered, nor should any attempt be made to give it more thickness, or a better form. A spirit-lamp and mouth blow-pipe is more convenient for softening the capillary necks, and sealing these tubes, than the table blow-pipe.

50. When the object is merely to close the ends of capillary tubes, it is easily effected, the tubes being cooled at the same time. When the fluids are of such volatility as to cause only a feeble stream of vapour from the aperture of the vessel, (and several such may be found amongst the substances held in vapour in oil gas,) the cohesive force of glass is sufficient to cause it to run together when softened,

and to seal the orifice, even though there be a slight pressure outwards. For this purpose the end of the capillary tube is to be introduced into the flame, and being touched with another piece of glass, the extremity is to be drawn off, and, at the same time, sealed: at the instant of doing this, it is to be removed from the flame, that it may cool and solidify, lest the heat of the lamp or hand should increase the tension of the vapour, and cause such pressure outwards as would be sufficient to expand the soft glass.

51. The process of sealing tubes hermetically, which have previously been exhausted of air, requires certain precautions to prevent the pressure of the atmosphere from either making an entrance, or forcing in the glass. Suppose it were necessary to enclose some camphor, hermetically, in a tube exhausted of air, that certain of its habitudes as to vaporization and crystallization under such circumstances might be observed. A tube of sufficient length is to be selected, and being closed at one end, the camphor is to be introduced; the tube should then be heated at about an inch from the open extremity, and should be contracted and thickened in the manner described, so that the smallest part may be about half an inch in length, about one-twelfth of an inch in internal diameter, and one-third of an inch in external diameter. A retort cap is to be cemented upon the open extremity, and a stop-cock attached to it. This being done, the tube is to be connected with the air-pump and exhausted, and the stop-cock being closed, the tube is to be removed from the pump in its exhausted state. The small flame of a spirit-lamp is now to be applied to the middle of the capillary part, so as to heat it gradually all round; as the glass softens, the pressure of the atmosphere will make it collapse and become solid, the passage will be obliterated, and the tube will be converted into a rod. This done, the heat is to be applied more immediately to the middle of the solidified part, which, when it has become soft, is to be drawn asunder. No difficulty will be found in doing this, without letting in the smallest portion of air, and, if proof of the accuracy of the process be required, it may be obtained, to a certain degree, by plunging the piece attached to the stop-cock under water, and breaking off the point there; if the water should enter in such abundance as to fill this piece, it will show that no common air has entered by the stop-cock, and the appearances will sufficiently indicate whether air has entered or not at the part heated. No attempt should be made to thicken, or in any way bring into form, the sealed end of the exhausted tube; for the pressure of the air will be almost certain to force in the softened glass, unless the operator be very skilful.

[TO BE CONTINUED.]

An Essay on Calico Printing.

[Extracted from Parke's Chemical Essays.]

[CONTINUED FROM PAGE 175.

The manipulation of printing may be thus described. The workman taking the block containing the pattern in one hand, applies

it gently to the surface of the sieve, so that a sufficient quantity of the thickened mordant may adhere to the figures. When the block is thus charged, he applies it to the calico, and gives it a blow with a small mallet, either slightly or otherwise, according to the nature of the pattern.

This alternate application of the block to the sieve and to the calico, is continued until the workman has gone over the whole piece. In this way several different mordants are sometimes applied to the same piece of goods. This is, indeed, always necessary, when the finished piece is intended to contain a variety of colours, the different colours requiring different mordants to fix them and render them permanent.

The calico is now removed to a room called the stove, where a certain degree of heat is given to it by means of flues, which go round the room on the inside, near the floor. In this room it is generally continued for at least twenty-four hours.* The intention of this is, to evaporate the acids used in the preparation of the mordants, and which might otherwise injure the texture, and also to fix the base more surely within the fibres of the cloth.

Whenever acetate of alumina is printed as a mordant upon calico, it appears to me that the pieces ought not to go into the stove until the work has been first thoroughly dried in the open air, because it is well known that the earth of alumina is precipitated from a solution of this salt in a high temperature. I suspect this to be the cause of many of those disappointments which are perpetually occurring in the production of the various shades of yellow and madder reds.

In the operation of stoving, an attention to temperature is of the utmost importance. In general, the room is kept at about 90°; but an intelligent calico-printer varies this according to the nature of the work under operation.

It was formerly a practice to expose all those calicoes which were printed with the several mordants, to a hot stove, for the purpose of evaporating the acids and fixing the base with more certainty in the fibres of the cloth; but of late years a more convenient method has been adopted, which consists in passing the calicoes by means of machinery along a set of apparatus known by the name of *steam-chests*. These are large square cast-iron vessels fixed at some little distance from each other, sometimes on an inclined plane, and in other cases perpendicularly one above the other; these are kept constantly full of steam, and are connected with each other by bent pipes either of iron or lead. It is so contrived, that the pieces of calico are made to pass over each of these heated chests, in contact with their surfaces; and, in consequence of the access of atmospheric air, as they pass from one of these chests to the other, they are generally found to have become thoroughly dried by the time they have arrived at the end of the series. A better apparatus has, however,

* This is when common red-liquor has alone been printed; but if citric acid or strong muriate of tin has been employed, less time is sufficient, and for the latter seldom more than half an hour is allowed.

been lately invented, consisting of an arrangement of cylinders made of tinned iron or copper filled with steam, and round which the calico is made to pass in succession. In this apparatus there is a vane fixed underneath every two of these cylinders, which is moved by means of the steam-engine, and agitates the air so as very much to facilitate the drying process. This mode of drying printed calicoes is so effectual, that, although the cloth be wound, from a heap at one extremity of the apparatus, upon the first cylinder quite in a wet state, it becomes thoroughly dry by the time it has passed over the whole apparatus, and falls in a perfect state on the heap at the other extremity of the apparatus.

If iron-liquor has been employed in printing the goods, it is an excellent practice to keep them for several days exposed to the atmosphere* after their removal from the stove, as the blacks, pompadours, olives, and, indeed, every other colour prepared with that metal, will increase in intensity; the goods will clean better in the dung-vessels, as will be explained hereafter, and the colours will rise higher, and brighter, when they come into the copper of bark or madder.

It may be worth an experiment to discover whether the colours containing iron, would not be better if they were suffered to be only a *very short time* in the stove, but were hung up instead, for several days, exposed to a current of air at the temperature of the atmosphere; as the iron would thus acquire the oxygen slower, and, consequently, would be fixed more firmly in the fibres of the cloth.

When the pieces have been properly stoved, they are passed, by means of a winch, through water at various temperatures, with a little cow-dung mixed in it. The intention of the dung is, to absorb and remove that portion of the mordant which is not actually combined with the cloth, and which, otherwise, might stain the white or unprinted parts.

This part of the business was formerly conducted in a very uncleanly and negligent way; but of late years some printers have incurred a considerable expense in the construction of their dunging machines, with cocks for hot and cold water attached to them, and thermometers to regulate the temperature.

I suspect, however, that the dung of the cow is serviceable in another way, besides that of cleansing,† though few printers may be aware of the nature of its operation.—It is acknowledged that madder, cochineal, and some other dyes, produce much better colours on woollen than on cotton cloths, owing to the former being of animal, and the latter of vegetable origin. I presume, therefore, that the dung imparts an *animal* matter‡ to the fibres of the cotton, and

* The iron in an acetous solution is in the state of the *black* oxide; but by exposure to the air it acquires a further dose of oxygen, and obtains the state of the *red* or peroxide.

† To *cleanse* calicoes by immersion in a dung-vessel, may appear to be a strange phrase; but as this is the technical language of the trade, no other term could be employed with propriety.

‡ Berthollet, who analyzed the dung of the cow, found in it a substance partaking of the nature of animal *bile*.

that this animal matter acts as an additional mordant, and thus more powerfully attracts the colouring particles of the dye, than the mordants alone would be capable of doing.

If a piece of calico, prepared with the acetate of alumina, be divided into two parts, and the superfluous mordant removed from the one by cow-dung and water, and from the other by water only, at the same temperature, it will be found, on passing the two portions through a decoction of weld, or quercitron bark, that the yellow will be much more intense and bright in that which has been submitted to the action of the cow-dung.

The process of DUNGING calicoes, is an operation that varies in time, from five to forty minutes, according to the style of the work. The pieces are then taken to the river or wheel, to be more effectually washed; and after this, they are passed through tepid water, in order that the workman may be assured that every impurity is removed.

His next care is to provide a copper boiler of pure cold water, into which a sufficient quantity of madder is broken, and then a fire is lighted underneath the copper. The calicoes, printed and rinsed as above, are now put into the boiler, and from the time they are immersed, the workman never ceases to turn the winch, so as to pass every part of the goods repeatedly through the liquor, until the whole acquires a boiling heat. Indeed, this operation is sometimes continued for ten or fifteen minutes after the bath of madder actually boils, when the pieces are taken out and washed thoroughly. In most of the large calico-works, a considerable improvement in the method of maddering has been adopted. This consists in giving a perpetual motion to the calico by means of the steam-engine. The ends of several pieces are fastened together, and then they are put into constant motion through the madder-vessel, whereby the colours are rendered more uniform; and one man is enabled to attend to three dying-vessels at one time, which is found to be a great economy of labour.

Madder is one of the most valuable drugs we have, for a variety of purposes in dying and calico-printing, as it is the agent by which the best and most permanent blacks are produced; also the finest purples, and every shade of red, from a pale pink, to a crimson. But, perhaps, it may not be generally known that this article improves by age. For instance: if a quantity of madder-roots be ground, and then packed tight in a cask, so as to exclude the air, and kept thus for six months, they will dye a much better colour, and go much further, than they would have done had these roots been used as soon as they were ground.

The process which is called MADDERING, has the effect of imparting all the requisite colours to the goods, by means of *one* operation, which may be thus explained:

While one mordant precipitates the colouring matter of the madder to a red, another precipitates a different portion of it to a purple, another precipitates it black, and so of every possible shade, from a lilac to a black, and from a pink to a deep red.

If a portion of weld or bark be added to the madder, every shade from a brown to an orange may be produced; whereas, if weld or bark alone be employed, all colours between a dark olive and a bright lemon can be imparted to the cloth. These changes are all occasioned by the play of chemical affinities, for the knowledge of which we are indebted to the improved state of chemical science.

The only materials which are employed by the calico-printers for the production of fine yellow, are the quercitron bark and the weld plant; the former is the bark of a peculiar kind of oak growing in America, the latter is the produce of our own country. The weld plant (the *reseda luteola* of Linnæus) is, for the most part, cultivated about Doncaster in Yorkshire. It is found, however, that nothing impoverishes the land so much; otherwise, it produces a very heavy and profitable crop.

Here it may be worth remarking, that, whenever it is of consequence to produce the finest yellows, or more delicate lemon colour, it is necessary to dry the pieces in the open air, as the stove would not fail to injure such colours; for stove-drying has always a tendency to convert a yellow to an orange. It is also necessary to be equally careful in the operation of dunging the mordants, for these pale yellows; for should this be done at a higher temperature than 96° or 100°, their beauty will certainly be impaired. There is another advantage in this, viz. by dunging at this low temperature, the dying may be completed even at 110° or thereabouts, which will give a much livelier colour than where a higher temperature has been employed.

The mordants generally used in calico-printing, are acetate of iron for browns, blacks, lilacs, &c.; and acetate of alumina for all the different shades of reds and yellows.

The best method that I am acquainted with, of preparing the acetate of iron for making the common black colour for calico-printing, is as follows:—Take the iron liquor of its full strength, or lowered with one or two waters, according to the goodness of this mordant, in the first instance, and then add about 2½ lbs. of flour to every gallon of the fluid, more or less, according to the goodness of the flour and the kind of work for which it may be designed. Having well incorporated the flour with the iron liquor, let the whole remain twelve hours, or more. After this, it is to be boiled for about half an hour, or till the whole be converted into a paste of due consistence, when it will be fit for use. The materials become better incorporated, and the colour is found to work better, by lying thus long before it is finished by boiling.

Formerly, the acetate of iron was made by digesting old iron hoops in sour beer, or in very weak vinegar; but, of late years, it has chiefly been made with the pyroligneous acid,* the oleaginous impurities of which tend, in some cases, to improve the mordant.

* If wood be submitted to an intense heat, when inclosed in an iron vessel of any kind with a proper aperture to allow the vapour to pass, this vapour, on being condensed, forms the acid in question, and is now known to be a kind of impure *vinegar*. The wood, in this case, is converted into *charcoal*, of which a great deal is prepared by this process, particularly for the formation of gunpowder.

Blacks are also produced by the nitrate of iron* and gallic acid; the mixture is called chemical black. The nitrate of iron, is made by dissolving metallic iron in a peculiar kind of aqua fortis. Common aqua fortis will not answer for this purpose; for, though it may dissolve the iron with rapidity, part of the metal is apt, very soon, to precipitate; which not only weakens the colour, but leaves the remainder so acidulous that there is always a danger of such a preparation injuring the texture of the cloth.

Chemical black is made by mixing a decoction of galls with the nitrate of iron just described; this produces gallate of iron, and, probably, some tannate of that metal: the disengaged nitrous acid then dissolves the two newly formed salts. The colour called chemical black, may, therefore, more properly be said to be a union of the colouring matter of galls, with the peroxide of iron, than a mixture of gallic acid with nitrate of iron. The gallic acid is, probably, like the pyroligneous, or, nothing but the acetous acid holding a peculiar vegetable substance in solution, and either the muriate or the sulphate of iron, if applied to cloth in conjunction with the colouring matter of galls, will, in time, produce as intense and durable a black, as the nitrate; but the difficulty of thickening the solutions of these salts, and the time which is required to convert their base into a peroxide, render them less fit for the calico-printer's purpose.

It is, however, necessary to remark, that the black which is formed by this solution of iron, is produced in a different way from blacks in general; for, when common iron liquor is used for this purpose, it is first printed on the calico; and when it has been sufficiently oxidized by exposure to the air, the goods are boiled in a decoction of madder, which renders such parts as had been printed with the acetate of iron, an intense black. But the black from nitrate of iron and galls, is applied at once to the cloth, and is not afterwards increased in intensity, or raised, as it is termed, by dying.

The calico-printer, by using a black ready formed, is thus enabled to mix it with other colours, in cases where, by dying alone, it could not be produced, as in conjunction with yellows and olives, raised by weld or quercitron bark.

The acetate of alumina is prepared by a mixture of the sulphate of alumina and potash, with acetate of lead, both in a state of solution; so that, on the theory of double decomposition, sulphate of lead is formed, which precipitates, while the acetate of alumina remains in solution.

Since the demand for this article has been increased, on account of the extension of the printing-trade, it has been prepared from the pyroligneous acid, by means of lime and alum. The following is the method:

The pyroligneous acid is first passed through a still, to divest it of a portion of the oil or tar which is always dissolved in it; it is then

* Nitrate of iron was not applied to calico-printing till within the last fifty years. This discovery formed an important æra in the trade, as it afforded the manufacturer the means of varying his styles of work in a multiplicity of ways and forms, which till then were entirely unknown.

saturated with lime, or whiting; and, lastly, the acetate of lime thus formed, is decomposed by a heated solution of sulphate of alumina and potash. The result of this double decomposition, is sulphate of lime, which precipitates, and acetate of alumina, which is drawn from the sediment of the calcareous sulphate, and preserved for use.

And here it may be necessary to caution the manufacturer against a misfortune that may befall him, if he be not conversant with the chemical nature of the substances he employs.

Magnesian limestone abounds in Derbyshire and in some of the adjacent counties; and should a maker of acetate of alumina employ such lime in his process, the article which it would produce, would, in all probability, be entirely unfit for the use of the calico-printer. But I must be more explicit.

In employing the common lime, in conjunction with alum, a sulphate of lime will be formed, as mentioned above, and this being nearly an *insoluble* salt, will precipitate. But here, sulphate of magnesia would also be formed, which, being a *soluble* salt, would remain in solution, and increase the specific gravity of the liquor, a circumstance which would be very apt to occasion the deception which I am anxious should be avoided. If magnesian limestone be employed, the liquor will appear good by the hydrometer; but as it will contain more Epsom salt than acetate of alumina, it will be unfit for every purpose for which it was intended.

While speaking of acetate of alumina, I cannot avoid remarking, that the process which has just been described for making this mordant, and which is followed, invariably, by many of the manufacturers in the north, is extremely improper, on account of the lime which is employed in it, be the lime ever so good, as that earth is very prejudicial to every species of red dye. The proper way of making it, though more expensive, is that which was originally pointed out by Berthollet, and which consists in decomposing sulphate of alumina and potash (common alum) by means of saccharum saturni, or acetate of lead.

[TO BE CONTINUED.]

Sketches of the Progress of Inventions, connected with Navigable Canals. Compiled from various sources.

[From the Boston Journal of Science.]

(Continued from p. 193.)

There is a great variety in the size of locks, as the canal is navigated by large, or small boats. The sea lock, near Inverness, on the Caledonian canal, is 180 feet long, 40 feet wide, and 20 feet deep, besides the lift, or difference of the levels, of 8 feet. The locks on the Derby canal, are 90 feet long, 15 feet wide, and 11 feet deep, including the lift of 8 feet. Those on the Leeds and Liverpool canal, are 70 feet long, 15 feet wide, with 9 feet lifts. In passing a lock,

every ascending boat requires a quantity of water just sufficient to fill the lock from one level to the other, together with a quantity equal to the weight of the boat. But a descending boat expels a quantity of water into the upper canal as it enters the lock, which is retained by the upper gates; equal to the weight of the boat and its lading. To make a double passage then, or for two boats, equally loaded to pass in opposite directions, it requires a quantity of water equal to the area of the lock multiplied by double the lift. This may, perhaps, be taken without any great error, on locks of medium size, at 320 tons.* A necessary precaution in fixing the site of

* In a memoir on navigable canals, by M. Girard, in the "Annales de Chimie," and which Mr. Doolittle has translated and published in Silliman's Journal, vol. 4. p. 102, the expense of water by locks, is examined at some length, as follows:—"Does there not exist a necessary relation between the fall, the quantity of water expended for the passage of boats, and the draught of water of the boats which ascend or descend through the locks? This is a question, which, notwithstanding its importance, has never yet been treated, and which I propose to resolve. To reduce the question to its most simple expression, we shall suppose: 1st. That the boat is to pass from one level to another, by a single lock. 2d. That the boats are of a prismatic form, and that their dimensions are such, that the interval which separates their sides from the sides of the lock, when compared with the space occupied by the boat, may be neglected without sensible error.

"Let S, represent the horizontal section of the lock and the boat; x, the lift of the lock, that is, the difference of level between the two basins which it unites; t', the draught of water of a boat which ascends the lock; t'', the draught of water of a boat which descends.

"The manœuvre of passing a boat from a lower to a higher level, consists in first drawing the boat into the lock through the lower gate, which is closed when the boat is in; 2d. Introducing, no matter by what means, from the higher basin into the lock, a quantity of water sufficient to bring the two surfaces to the same level; 3d. Opening the upper gate of the lock, and passing the boat through into the upper basin. Hence we see that to effect this passage, and in order to raise the surface of the water in the lock to a level with that in the upper basin, it is necessary to draw from that basin a prism of water $= Sx$, whose base is equal to the horizontal section of the lock, and whose height is represented by the lift of the lock. Furthermore, when the boat passes from the lock into the basin, its place in the lock is necessarily supplied with a quantity of water $= St'$, equal to the volume of water which it displaces, and which flows from the basin into the lock.

"Thus the quantity of water expended in bringing things to their present state, may be expressed by $Sx + St'$. Let us suppose that, the communication remaining open between the upper basin and the lock, another boat is ready to descend, the manœuvre is reduced to 1st. introducing the boat into the lock and shutting the upper gate; 2d. emptying the lock until its surface is on a level with that of the lower basin, and 3d. opening the lower gate and passing the boat into the lower basin.

"The introduction of the boat from the upper basin into the lock, has caused a reflux from the lock into that basin, of a volume of water $= St''$, equal to that displaced by the boat. In letting off the water from the lock, to lower its surface to a level with that of the lower basin, things are replaced in the same state as they were before the ascent of the first boat.

"This operation, which we shall denominate *a double passage*, has caused an expenditure of water represented by

$$Sx - S(t'' - t') = Sy$$

since the quantity of water expended may always be represented by a prism,

locks, is to avoid placing them too near together, for in such case, the water let out of the upper lock on the passage of a boat, will overflow the banks of the subjacent level, and not only be lost, but be likely to injure the works. The locks should be all of equal height, so that the water used at the upper lock, or an equal quantity, may serve for the passage of the boats through the lower lifts.

A great many contrivances have been proposed, either as improvements of the common lock, or a substitute for it. If, in a lock of the common construction, we consider the water which is let down from one level to another, in the light of a force expended to produce a given effect, which is, the elevation or depression of the boat and its load, there is a loss of the acting force unknown in any other mechanical operation. Thus, to raise a boat and load weighing 30 tons, through 8 feet, it will, in general, require 180 tons of water, falling through an equal space. But, in descending boats, the effect is *negative*, and the disparity between this and the force, is yet more striking. If, therefore, in transferring boats from one level to another, the economy of force only were considered, the inclined plane, arranged as it is in England, must be very advantageous, the expense of force being in theory, merely the small sum required to overcome the friction of the machinery and the inertia of the moving masses.

Mr. Fulton, who paid much attention to this subject, in the early part of his life, says, "I do not hesitate to prognosticate the annihilation of lock canals by improved science, in like manner as improvements in machinery render the old apparatus useless." (Fulton on Canals, p. 28.) A bold prediction, which seems yet very far from being fulfilled. This gentleman was then highly in favour of the inclined plane as a substitute, not only for locks, but for aqueducts. In his work published in London in 1796, he has detailed, fully, his plans. His machinery, besides the inclined plane, may be described in general terms, as consisting of an endless chain running over wheels, fixed, one at the top and one at the bottom of the plane;

whose base is equal to the horizontal section of the lock, and whose height is represented by an indeterminate line y. Dividing this equation by the factor S, common to all its terms, it becomes

$$y = x \quad (t'' - t',)$$

which belongs to a right line of simple construction. It expresses, moreover, between the lift of the lock, the draught of water of the boat, and the quantity of water expended, relations which, notwithstanding their extreme simplicity, have not, hitherto, been remarked.

"It follows, from this equation, that the expense of water, y, will be positive, null, or negative, according as we have:

$$x > t'' - t'$$
$$x = t'' - t'$$
$$x < t'' - t'$$

Thus it appears, that the expense of water from any level, may not only be diminished at pleasure, but that it may be rendered null, and that a certain quantity of water may even be raised from a lower to an upper contiguous basin."

There is, perhaps, no instance on any canal, where $x < t'' - t'$, or even where $x = t'' - t'$. Still, however, the investigation may be extremely useful, as showing the relations which exist between the loads which pass through the canal, the lift of the locks, and the expense of water.

to this chain are to be attached two boats, in such a manner that the descending boat assists in dragging up the ascending one. The small force which may be necessary to pass the boats so arranged, over the plane, is to be supplied by a vessel of water descending through a shaft from the upper canal. The boats are to be small, and they are to be provided with wheels, to diminish the friction, in passing over the planes. Various other modifications of the inclined plane, have been proposed; some of which, as has been before observed, are advantageously used in peculiar situations. None of them, however, are thought, at the present time, likely to become a general substitute for the lock.

Another contrivance, called the balance lock, consists in floating the boat into a case or vessel, at the termination of one canal, and moving it vertically, by machinery, to the other canal. There are two of these cases suspended over the same pullies or axle, so that they at all times balance each other, and that, whether one or both contain boats; because they are so executed, that a boat on entering, expels from the case a quantity of water equal to its own weight, and the same quantity returns to the case when the boat is passed out. But one of the most ingenious machines which has been invented to avoid the loss of water, is described in the Repertory of Arts, vol. 1, p. 81, 1st series. It may, perhaps, be considered as a modification of balance locks, previously invented; still it exhibits great originality and inventive power in its authors. It is necessary in this, as in other balance locks, that the two canals terminate in the same vertical plane; the end of the upper canal being closed, by gates, at its termination. Things being in this state, a well or pit is sunk at the head of the lower canal, of a depth somewhat exceeding the difference of elevation between the two levels. This pit is filled with water, and a diving chest or buoy, sufficiently strong to bear a heavy external pressure, is then made and put afloat over the pit. On the top of this chest several strong posts are erected, high enough to reach the bottom of the upper canal. These posts support a cradle, which is open above and nearly filled with water, and having gates at both ends, through which the boat may pass in and out. The specific gravity of the buoy, must be so much less than that of its surrounding water, as to be just able to support the load, consisting of the pillars and cradle, which are fixed to it, together with the canal boat and a sufficient quantity of water to keep it afloat in the cradle. When so loaded, it should be just covered by the water in the pit, where it can now move up and down, on the application of a very small force, like the balloon, or the Cartesian Devil. To let down a boat from the upper level, the end of the cradle is fixed by screws to the gateway of the canal, the gates of which, as also those of the cradle at the end next to the boat, are then opened; the boat enters from the canal into the cradle, displacing a quantity of water just equal to its weight, consequently, the burden on the buoy is not altered. All the gates are then closed, and the fastenings, which confined the cradle to the gateway, taken off; when, on the application of a trifling force to the mass, the buoy descends to the bottom

of the pit, bringing the boat to the plane of the lower level. The gates in the end of the cradle are then opened, and the boat passing out, its place is supplied by water from the lower canal.

There is yet another contrivance (Rep. vol. 2. p. 235,) differing considerably from the above, although of the same class. It is a caisson or diving-trunk, made so as to be perfectly tight when the gates at its ends, are closed. This floats in the lock between the two canals. The canal boat is received into it, and it is made to descend, through the water of the lock, to the plane of the lower canal; when by opening the end of the caisson, and corresponding gates in the lower part of the wall of the lock, the boat is passed out. The ascending motion is obtained by pumping water out of the caisson, which operation is reversed, to obtain a descent. In this and the preceding invention, the manner of passing an ascending boat will be understood, from the operation of descending, which has been described.

In another and distinct class of contrivances, it is proposed to fill the common lock, by elevating water from a sort of cistern, made near it. To accomplish this, different kinds of plungers are to be used, some of which are very ingenious, particularly those of Betancourt, Steevens, Busby, and Bogaerts. In these, the plungers are so counterbalanced, as to be always in equilibrio with the water in the lock, at whatever height it may be; consequently, the application of a very small force, destroying the equilibrium, produces the rise or fall of the water, as may be required.

Although some of the preceding machines have been erected on the large scale, and have given promise of success, they have not made their way to public confidence, and have, in the end, been generally abandoned. We have thought, however, that it might be useful to recapitulate some of the inventions connected with so important a subject: several of these show, that their authors were well acquainted with the laws of fluids, and that they pursued their designs with sufficient ardour to have conquered any small difficulties.

We have omitted mentioning before, an ancient and very obvious method, because it has been often used, and found to answer its design, and has, lately, appeared in a new form, and is said to be now in operation on the Regent's canal. There is an account in Belidor's *Architecture Hydraulique*, of a lock, constructed by M. Dubie in 1643, on the canal of Ypres, on this principle, where the lift was 20 feet. In this, two reservoirs were formed, one on each side of the lock with which they communicated, but on levels differing from each other: both of them, however, being between the levels of the canal. When the lock was full, and it was required to empty it for the descent of the boat, one-third of the water of the lock was let off into the upper reservoir; another third was then let off to the lower reservoir; the remaining third, having an elevation but little above the lower canal, was then let into it, and the boat passed out. Now, in these operations, supposing the reservoirs of such extent that the water let into them would not sensibly elevate their surfaces; two-thirds of the water which filled the lock, is still retained, at

more than two-thirds of its former elevation, and it may be again applied to fill the two inferior thirds of the lock: this was done in the canal above described, and the whole quantity of water required from the upper canal, to pass a boat, is said to have been but six feet. It is evident, that if the water be divided among a great many reservoirs, all on different elevations, the water of the locks may be saved to a yet greater extent.

Several locks with reservoirs, resembling the above, have been constructed in England. The form used on the Regent's canal, to which we have alluded, consists of two locks placed beside each other. One of these being filled, and the other empty, and two boats ready to pass in different courses, the water is permitted to run from the full lock into the empty one, which it fills half full; the remainder is then supplied from the summit, and the boat elevated to the upper canal, while the boat, and the remaining water in the other lock, is let off as in ordinary cases.

[TO BE CONTINUED.]

On Crude, or Unburned Bricks, and on Factitious Stone. Abstracted chiefly from M. HASSENFRATZ'S *paper on that subject. By the Editor.*

IT is a fact well known, that crude, or unburned bricks, were extensively used by the ancients, as they are found in the ruins of various towns and edifices, which were erected at a very remote period of time; among these may be particularly mentioned, the ruins of Babylon, from which, at a recent period, have been obtained both burned and unburned bricks, in a state of preservation so perfect, as to exhibit the inscriptions impressed upon them at the time of their formation.

In Europe, and in this country, the use of burned bricks of small dimensions, has been continued, but crude bricks are rarely employed; scarcely ever, indeed, excepting in the construction of ovens, furnaces, or fire places, where they will receive a degree of baking, which will render them durable. Crude bricks are still extensively used in some countries of Asia, and it may be worth while to inquire, why the practice is not more general, particularly in places where stones and fuel are scarce.

Two opinions upon this subject, altogether irreconcilable, have each their advocates. Crude bricks, it has been declared, have but little solidity, and soon moulder; it has been on the other hand averred, that they are so durable, as to be preferable to stone, for building. From the details given by Vitruvius, who flourished in the reigns of Julius and Augustus Cæsar, it appears that crude bricks of two kinds were anciently used; the one, made of a mixture of sand and argillaceous earth, very similar to that we now employ; the other a mixture resembling our mortar, being a composition of lime and sand, or of lime and other substances, forming a kind of

artificial stone. The first kind required and received a long desiccation, as they were frequently large in their dimensions, and if not thoroughly dried before having been used, they would afterwards have shrunk, to the injury or destruction of the building.

Argillaceous bricks, when used unburned, must contain a much smaller portion of sand, than those which are burned, as they would, otherwise, readily absorb moisture, and soon crumble; and this circumstance will account for the great length of time required to dry them. The purest natural clay would, probably, be the best, and this, if repeatedly pressed during the desiccation, would acquire a degree of solidity, which would enable it to withstand the vicissitudes, even of our variable climate. In hot and dry countries, as in Arabia, where it seldom rains, crude bricks of a less firm texture, may last for ages, with little or no apparent change in their appearance.

Ancient ordinances are still extant, which declare the dimensions that the bricks ought to have, as well as the proportionate thickness and elevation of the walls; and also the length of time during which crude bricks must be allowed to dry. At Utica, this was extended to five years, a less period not being accounted sufficient to ensure that perfect stability which should preserve the plaster work, or other incrustation with which they were to be covered, from a liability to be loosened and separated. The bricks in general use among the Romans, were a foot long, and half a foot broad. Two sorts were used by the Greeks, the one measuring about a foot, and the other about fifteen inches on every side; the first were used in private, and the latter in public, buildings.

In Babylon, and other places, a kind of bitumen was used as a cement for the bricks, and this, as it became extremely hard, and was impervious to moisture, had a powerful tendency to protect the crude, argillaceous bricks from the influence of atmospheric changes.

To the second kind of crude bricks, which are made with mortar, may be given almost every degree of hardness, from that of the most fragile, to that of a very hard and durable kind of stone, according to the goodness of the lime, and the qualities of the other materials entering into their composition.

The Romans regulated with great care the preparation which should be given to mortar, before it was employed; and M. Delafaye has pointed out many mortars proper for the formation of these bricks, or factitious stones; as, for example, one measure of lime, slacked dry, and three measures of pounded stone, sifted, to which add the necessary quantity of water, and work the whole well up together: or, secondly, one measure of fine dry sand, free from clay; one measure of sifted stone powder, and one of dry slacked lime, with just water enough to make it unite, and then well worked together:—thirdly, five parts of rough, sharp sand; two parts of fresh burned, dry slacked lime, with water enough to render it adhesive, but no more:—fourthly, one measure of dry, pulverized clay, kneaded with oil; eight measures of fine clean sand, or of pulverized and sifted stone, or of the two combined, and two measures of recent quick lime; moisten the eight measures of sand or stone, and work them

up like soft mortar; bruise the lime, fine, and add it thereto; with a trowel or pestle, knead it well up together, adding water if necessary, to render the whole adhesive, but no more of it than is requisite for this purpose; when perfectly mixed, and whilst yet warm from the slacking of the lime, add the clay which was kneaded with the oil, and beat them till thoroughly incorporated. This mortar must be quickly used, as it will speedily set, and become impervious to moisture.

In Piedmont, factitious stones are made, which they call *prisms*, from the form given to them, which is that of a triangular prism, as they are principally intended for the projecting angles of walls. They use an excellent aquadurant lime, which is slacked in the usual way, and left for four or five days, to complete the process; it is then placed in the centre of a hollowed heap of sand, unequal in grain; from the ordinary size to that of coarse gravel; the whole is then carefully mixed. A triangular trench, of indefinite length, is prepared in a situation free from the risk of inundation, the sides of which are carefully smoothed by the aid of a trowel and some water. The prism is then formed by successive beds of the mortar, and pebbles of uniform size, equally distributed: the prism is then covered with the earth, which had been dug out, to the thickness of nearly a foot. The proportions of the ingredients used, are about 14 parts of lime in a pastey state, 90 parts of the unequal grained sand, and 20 of the pebbles. These prisms commonly lie buried for three years; at the end of this time they will bear very heavy loads; and when let fall upon each other from a height of 20 feet, or upwards, may be chipped at the corners, but will not be broken.

From the ordinary kinds of lime, good small bricks of this description, may, undoubtedly, be made; but for factitious stones of large size, those limes must be used which solidify quickly, as the magnesian lime and puzzolano of Italy; Parker's cement, and the other hydraulic limes of England, and of this country, or the factitious hydraulic limes, like that described p. 355, vol. 3. of this journal; or p. 371, vol. 2. Moulds of various forms may be made, and the artificial stones consolidated by beating and pressure, whilst yet partially soft.

Delafaye is of opinion, that to the numerous other proofs of the ancients having made large artificial stones, for many of their edifices, the great Egyptian pyramids may be added. The stones which form the facings of these structures, he, unhesitatingly, declares to be of this kind. They have all the same dimensions, and are about 30 feet long, 4 broad, and 3 in height. They have no connecting cement, and fit so closely, that the blade of a knife cannot be inserted between them. A fragment, when sawed or broken, perfectly resembled factitious stone; being without any connecter, such as usually appears in the natural compounded stones. A fragment of a similar stone, which was taken from the ancient buildings in Alexandria, contained, imbedded in it, a piece of brick, which had, evidently, been burned in a furnace. There is no quarry, within a very great distance, from which the stones could have been obtained: and it is

also thought, that their weight, about 65,000 lbs. each, is so immense, as to render it highly improbable that they could have been transported, and afterwards raised to so great a height.

Several other reasons are urged to prove the correctness of the opinion, that these and other large masses of stone, are factitious. In more modern buildings, it is declared that artificial stone has been employed; the pillars of the church of St. Amand, in Flanders, and the columns of that of Vezelai, in Burgundy, are, it is said, acknowledged to be of this kind.

We shall not introduce the reasoning of those who deny, or controvert the opinion of the factitious character of these stones, as we have now nothing to do with this controversy, our only object being to show that such stones were, probably, made by the ancients; and that, certainly, we have the materials, and are acquainted with the process by which they may be formed. These materials are various, and require to be differently treated. Those which set slowly, may be consolidated and improved by beating and pressure; those which set quickly, like Parker's cement, and some others, must be allowed to do so undisturbed. Some kinds should be allowed to consolidate, shut up in a damp situation, or covered up in the ground. Experiment and observation, in fact, must determine the best mode of procedure, in each individual case.

ENGLISH PATENTS.

To John Guy, *and* Jacob Harrison, *Straw Hat Manufacturers, for their invention of an improved method of preparing Straw and Grass to be used in the manufacture of Hats and Bonnets.* Enrolled January, 1827.

The subject of this patent purports to be an improved method of drying and preparing straw and grass for making ladies' hats and bonnets.

The straw is to be gathered soon after the corn has come to the ear, and long before it is in a state of maturity, that is, in the latter part of the spring, or beginning of summer. The straws may be cut off near the ground, or drawn out of the ground with the roots. About one hundred and fifty straws are to be tied up in a bundle, and these bundles are to be laid upon a grass field, and spread out in the form of a fan, where they must be allowed to remain for two or three days and nights, occasionally turning them over: after this, they are to be tied up in larger bundles, and suspended under sheds, upon lines or on hooks, for the purpose of drying up the sap.

From these places of shelter, the bundles of straw are to be removed into the sunshine, whenever the weather is fine, and frequently turned over, but great care must be taken, that they are always protected from rain, or other moisture, as the colour would become injured by damp. If by these means, the straws are not brought to a

beautiful gold colour, it may be desirable to expose them to the sun, in glazed houses, until the gold-like appearance has been perfectly attained. The straw thus prepared, may now be laid by for use, or for the market, in warehouses or stacks, observing that it be carefully protected from damp. It may be necessary to say, that wheat-straw is preferred for the purposes of making hats and bonnets, but other straws will, sometimes, answer nearly as well.

When grass is the material intended to be made into bonnets, in imitation of Leghorn, the stems of grass are to be gathered when its seeds first make their appearance, and are to be prepared and dried in the manner above described.

[*Lond. Journ. of Arts and Scien.*

To THOMAS JOHN KNOWLYS, ESQ. *and* WILLIAM DUESBURY, *Colour Manufacturer, for their having invented certain improvements in Tanning.* Enrolled February, 1827.

THIS improved mode of tanning, consists in suspending the hides in a close vessel, from the interior of which the air is to be exhausted by means of an air-pump, and when the vacuum within is sufficiently perfect, the tanning liquor is admitted, which immediately penetrates into the pores of the hide, occupying the place from whence the air has been extracted. By these means the operation of tanning will be greatly facilitated.

The hides to be tanned, are introduced into the vessel, and are suspended by hooks at the upper corners, with weights at bottom to keep the skin extended. As many of these hides as may be required to be tanned, are in this way placed within the vessel, and when the lid is tightly fixed on, the air is to be extracted from the interior by means of an air-pump.

When a sufficient exhaustion has been effected within the vessel, the cock of the air-pump is to be closed, and another opened, and the tanning liquor introduced; after which, the air-pump may be again worked to draw all the air from the pores of the skins; and to prevent ebullition, a quantity of oil is to be placed upon the surface of the tanning liquor.

The tanning liquor is to be first used in a weak state, and its strength increased daily, until the process is complete. A pump and tube, are to be employed for drawing off the spent tan liquor.

The subject of this patent is an example of the wide range through which a valuable hint may be sometimes usefully extended. In the second volume of our first series, page 36, will be found a communication from John Oldham, Esq. of the Bank of Ireland, on his improved method of sizing, dying, and wetting paper, for printing Bank Notes, and other purposes, which process was, by placing the bundle of papers, in a close vessel, and after exhausting the air from the vessel, and, consequently, from the pores of the paper, intro-

ducing the size dye or water, which instantly penetrated the paper, in a more perfect way than had been effected by any other means that had been before resorted to.

The same mode of operating, has been, subsequently, employed in dying, and in some other branches of the arts, with very great success, and is, in the patent above, proposed to be applied to tanning. But with what propriety it can now be claimed as a new invention, we do not see; the exclusive right of employing the same principles, as a novel process in tanning, appears to us to be rather equivocal.

[*Ib.*

To William Cleland, *Gentleman, for his Improvements in Evaporation.* Enrolled January, 1827.

The principal object of these improvements is, to cool liquids, such as brewers' worts, distillers' wash, dyers' liquors, &c.; the mode proposed is, to separate the particles, by causing them to descend in a shower, through which a current of air is to be passed.

The rationale of this process, depends upon the principle, that the steam from heated liquors, carries off a very considerable quantity of caloric; if, therefore, the particles of the liquor, can be so separated, as to increase the surface, and, consequently, the quantity of steam evolved, the cooling process will, by that means, be facilitated.

The patentee has not exhibited drawings, of any precise form of apparatus, but states, that over the boiler, or pan, containing the hot liquor, he places a vessel intended as a reservoir, into which the hot liquor is to be raised from the boiler, by means of a pump. The bottom of this reservoir, is partially perforated with holes, like a colander, extending across the bottom, and about twelve inches wide. Through the colander, the hot liquor descends in a shower, and the air having a free passage under the reservoir, through the shower, drives off the steam, and cools the liquor.

The steam may be conducted into a chimney, and thence escape into the air, or it may be passed through tubes, and brought under other pans, for the purpose of heating other liquors, by which means a saving of fuel will be effected.

In order to increase the effect, several colanders may be placed, one below the other, and the liquor be made to pass through them in successive showers. It is presumed, that the natural current of the air, will be sufficient for the accomplishment of the object; but if it should be found necessary, a blast of air may be produced, by means of a blowing machine.

Instead of employing cold air at all times, the patentee proposes, under some circumstances, to pass a current of dry heated air from a furnace, through the shower of liquor, which air having been rendered extremely dry, is then capable of absorbing the steam or moisture, which contained the heat, and this heated air may be mixed

with the smoke and other vapours, from the furnace, and be conducted in the manner above explained, under other evaporating pans, to heat them. [*Ib.*

To William Parsons, *Naval Architect, for his having invented certain Improvements in Building Ships or other Vessels, which improvements are calculated to lessen the dangerous effects of internal or external violence.* Enrolled January, 1827.

The patentee describes the modes of putting together the ribs of that description of vessels, employed for the East India service, and explains the present ineffectual mode of securing them merely by the flooring timber; to obviate which disadvantage, the present improved mode of strengthening vessels, is suggested.

The proposed improvement is, the introduction of cast iron framings, which are to be applied so as to connect the several ribs, and other timbers together, and which are to be placed in every part of the vessel, forming them, of course, according to the situations to which they are to be applied.

In thus adding to the weight of the ship, the patentee considers, that no disadvantages will arise, as the quantity of iron employed, will, in part, supersede the necessity of ballast, and, instead of weakening the vessel, as ballast would do, it will give it additional strength.

As the iron pieces must be formed, to suit the parts to which they are to be applied, no precise figure can be given, but they are to be made with grooves and rebates, to fit and take hold of the ribs, and with holes to receive the bolts or other holdfasts.

The patentee says he claims the connecting frames, for all purposes to which they may be applied, in ship-building. [*Ib.*

To John Charles Schwieso, *Musical Instrument Maker, for his Invention of Improvements on certain stringed Musical Instruments.* Enrolled February, 1827.

These improvements consist of three particulars. 1st. Connecting each of the tension forks, in the head of a harp, which act upon the *natural* strings, to springs placed over the top, for the purpose of steadying the forks, and keeping them from jarring, when the strings are touched. 2nd. Attaching springs to the back parts of the axles, or pins of the forks, which belong to the *sharp* strings, in order to press them to open, and operate against the pedal action. 3dly, Placing screws in a frame, in any situation between the ends of the strings, and the first bridge of a piano-forte, or other such instrument, which screws are intended to act upon the strings, for the

purpose of regulating the tension, that is tuning, with very minute accuracy.

The methods of adapting these contrivances, and their forms, may, of course, be varied according to circumstances; it is, therefore, unnecessary to exhibit figures, representing them, as the intention must be obvious, and the particular mode of carrying it into effect would, in a great measure, be subject to the judgment of the workmen.

By these means, the patentee considers the tones of such harps, piano-fortes, and other stringed musical instruments as the contrivances may be adapted to, will be greatly improved. Other advantages will also arise, which are not explained. [*Ib.*

To PETER MACKAY, *Gentleman, in consequence of a communication made to him by a foreigner, residing abroad, for an Invention of certain Improvements, by which the names of Streets, and other inscriptions, will be rendered more durable and conspicuous.* Enrolled June, 1827.

THE subject of this patent is, enamelling letters on glass, which, being put together, and made fast in a frame, are to be employed for out of doors inscriptions, such as the names of streets, in situations exposed to the weather.

The method of making the letters, as proposed by the patentee, is this:—Take pieces of common window glass, and having carefully cleaned their surfaces, paint upon them the required letters in enamel colour, using, if necessary, a drawing at the back of the glass, or a metal letter, as a pattern. If, by the spreading of the colour, the shape of the letter, when so painted, is inaccurate, that is, too thick in parts, the paint must be carefully scraped off from the glass, in those parts, and the glass wiped very clean.

The painted glass may then be burned, or baked in an oven as usual, to fix the enamel, and must be allowed to remain in the oven or kiln, until cold; when the back of the glass must be varnished, or otherwise covered with a dark coloured material, in order to render the white letter conspicuous.

The pieces of glass, with the letters so prepared, being now cut square, may be put together in a slight iron frame, and formed into words, the letters being secured therein, by means of cement or mastich.

Names, or other inscriptions, so formed, being fixed up at the corners of streets, will be found to be very much more conspicuous and durable, than those painted in the ordinary way.

The patentee observes, that he is aware letters have been enamelled on glass before, but claims, as his invention, the employment of such enamelled letters for the inscriptions at the corners of streets, and other exposed situations. [*Ib.*

To Joseph Cliseld Daniell, *Clothier, for his Invention of certain Improvements in Preparing Wire Cards, for Dressing Woollen and other Cloths.* Enrolled December, 1827.

This improvement in wire cards, is designed to render them more fit for the dressing of cloths, than wire cards of the ordinary kind, the patentee proposing to employ them in the gig machinery, as a substitute for teasles.

The wires for making these improved cards, are of two kinds; first, slender wires with sharp hooked points, standing out for the purpose of penetrating into the cloth as it passes, and drawing out the fine ends of wool which are to constitute the pile: second, a stiffer sort of wire, with blunt points, standing a little below the former, which are designed to protect the cloth, and prevent its surface being too much disturbed and injured under the operation of the machine.

The ordinary construction of wire cards, is so well understood, that the above description, it is presumed, will be perfectly intelligible: it is only necessary to add, that the same improved cards, are proposed to be employed for hand dressing, as well as adapted to the gig barrel, and in that case, it is adviseable to place three or four rows of the stiff protecting wires, in the front part of the card, to prevent the points penetrating too far into the cloth. [*Ib.*

To Joseph Frederick Ledsam, *Merchant, for an Improvement in Purifying Coal Gas, by means not hitherto used for that purpose.* Dated March 2, 1827.

Mr. Ledsam divides the improvements, comprised by his patent, into two classes, the first of which relates to the preparation of the coal gas for combustion, and the second, to depriving it of all fetid odours.

For the first purpose, muriate of ammonia (which is obtained by pouring muriatic acid into the ammoniacal gas liquor, and by the evaporation and crystallization of the mixture) is dissolved in water, in a large vessel, and to this solution, lime is added, in the proportion of 50 pounds to 100 pounds, of the muriate of ammonia; and through this liquor, stirred up occasionally, the coal gas is made to pass on its way to the gas-holder. When the prepared liquor ceases to act, it is drawn off, and fresh materials are put into the vessel, as at first: and to the liquor that has been drawn off, muriatic acid is added, and then muriate of ammonia is prepared from it, by the process above-mentioned. Sometimes the patentee uses sulphuric acid, instead of muriatic acid, in which case he uses magnesian lime in place of common lime, in order to obtain sulphate of magnesia (Epsom salts) from the liquor, as well as sulphate of ammonia; which

latter he then uses instead of muriate of ammonia, for the purpose first stated.

In order to deprive the coal gas of its fetid scent, which is the second object of the improvements, the patentee mentions that he uses "chloruret of sodium, or chloruret of calcium," (commonly called oxymuriate of soda, and oxymuriate of lime,) but by preference the latter, on account of its greater cheapness; of either of which he adds about 1 part to 30 of water, in a shallow vessel, and causes the gas to pass through it before it is conveyed to the burners; which he asserts, not only deprives it of all disagreeable odour, but makes the air of the room in which the gas is burned, pure and wholesome. A shallow vessel of 4 inches deep and 18 inches square, filled with the solution of the oxymuriate, is stated to be sufficient for the purification of gas enough for one burner.

The chloruret, or oxymuriate of lime, may also be used in the state of powder, for the purification of the gas, by making the gas pass over an extended surface of this salt; but the method first mentioned of using it in solution, is preferred by the patentee.

[*Repertory.*

A Report on a Process for Seasoning Timber; invented by John Stephen Langton, Esq.

Mr. Langton having discovered a new method of seasoning timber, consisting in the removal of the greater part of the atmospheric pressure, and the application of artificial heat, by which the time necessary to season green timber, and render it fit for use, is only about twice as many weeks as the ordinary process requires years: he requests my opinion, first, on the influence this mode of seasoning may be expected to have on the wood; and secondly, on the practicability and advantages of the process on the large scale.

The ordinary mode of seasoning timber, consists in evaporating the fluid matter, (called sap,) by the natural warmth of the atmosphere, with the precaution of screening the timber, both from the direct action of the sun and wind, otherwise it cracks and receives much injury.

But seasoning, by the natural warmth of the atmosphere, proceeds slowly and irregularly, and much loss by decay takes place, unless the operation be conducted under the protection of a roof, to exclude rain and snow. Seasoning under cover, is still a slow, though an expensive process, for at least three years should elapse, from the time of felling the tree, to that of its being used in such framing as is wanted in naval architecture; hence, a stock of timber, equivalent to four years consumption, must be kept on hand, and three years consumption must be either under cover, or suffering still greater loss, by exposure to the wet.

In the new process, the power of an air-pump is added, to draw the sap out of the interior of the wood, and the tendency of the fluid

to the outside being thus increased, a higher temperature than that of the atmosphere can be applied, with less risk of causing the timber to split; consequently, the process may be completed in less time, and a few trials will show the best relation between the time and heat for the different kinds of wood.

Having briefly stated the process, I can, with more clearness, show the strong grounds on which my opinion is formed.

First, then, as to the effect on the durability and strength of the wood. In the new process, as in the ordinary one, the sap is removed by evaporation; no solvent of the woody fibre is, therefore, introduced in either case, while the sap itself, being a fluid readily affected by temperature and other agents, it seems obvious, that the sooner it is wholly removed from the wood, the better, provided the woody fibre contracts and solidifies without injury. That this may be done, is evident, from the specimens from which the sap has been extracted; they exceed the usual density of specimens equally dry, and have lost about the same weight in drying, that is lost in the usual method, with a somewhat greater degree of shrinkage. The sap which is extracted, is a nearly clear liquid, having a sweetish taste, with a very peculiar flavour, and a musty and disagreeable smell. The latter seems to proceed from a light, flocculent kind of matter, floating in the sap, affording the strongest evidence, that the sooner such matter is removed from timber, the better; and as it appears that the whole of this matter is removed by completing the process, I am of opinion the new mode of seasoning will render timber more durable than the common one, and it does not appear to be in any degree deteriorated in strength.

Secondly, the method is, undoubtedly, practicable on the large scale, and at an expense not exceeding ten shillings per load, with the advantage of setting free, at least half the capital required by the common method; the advantage of rendering the living tree available, either for defence, convenience, or common use, in a few weeks after being felled, and in a state in which it may be trusted with safety; while, by the usual method, five years is not more than is necessary to be equally free of risk from shrinkage and decay. The usual practice is, to use timber partially seasoned, in consequence of which, the sap has to evaporate, and the wood shrinks, the joints open, and the carpenter's skill in framing, is rendered nugatory; for, as timbers shrink, frames change their form, and lose their strength, and ships and houses alike afford evidence of the fact, particularly ships sent out to warm climates.

It only remains to add, that, by the new method, the whole of the natural sap is extracted at once, from the tree; it is known, by very simple means, when the whole has been extracted; the process requires only eight or ten weeks; it is more economical, and locks up less capital than the common method; and it contributes to the durability and soundness of timber framing. THOMAS TREDGOLD.

[*Lond. Journ.*

On the Silk Worm.

To the Editors of the London Journal of Arts, &c.

Gentlemen,—Having some years ago been led in the course of business, to reside for some time in the south of France, and being intimately connected with silk reeling, my attention was attracted to several particulars in that branch of French national industry; among others, the following has always appeared to me to be well worthy the attention of men of science. Every one who, whether in England or abroad, has ever bestowed the slightest attention on the silk worm, either as a matter of curiosity, or as a matter of business, must be well aware, that some of the cacoons are white and some yellow, but every one is not, perhaps, aware that yellow gum silk, reeled from the yellow cacoons, is strongly impregnated with an odour, resembling that of violets, at the same time that white gum silk reeled from white cacoons, is perfectly free from odour of any description; I therefore beg leave to propose, for solution, the following question. "What is the reason of yellow gum silk being impregnated with an odour of violets, whereas white gum silk is free from that or any other odour?" Having proposed the question, I add the following particulars for the information of those who may be disposed to attempt the solution of it. 1st, the fact above stated, is invariably found to exist, in the south of France, even though the worms, forming the different coloured cacoons, may have sprung from the same parent stock, and even though they have been fed from the same tree; 2nd, the yellow gum silk is always specifically lighter than the white; and, 3d, so strong is the odour of violets with which the yellow gum silk is impregnated, that a few pounds of yellow being confined for two or three days with several cwts. of white, shall suffice to impart a strong odour of violets to the whole mass; let both be exposed to the air, the white soon looses its acquired perfume, but the yellow retains it, and will continue to do so for ten or twelve months. In what I have stated above, I should wish to be understood, as confining myself strictly to French silk, and that in the raw state, before it has been submitted to the operation of throwing; whether the same peculiarity exists in the Greek, Chinese, and Indian silks, I have had no opportunities of judging, nor can I, not being perfectly acquainted with their system of reeling, form an opinion, whether in that operation, there may not be some extraneous matter employed, which might, even if the peculiarity above named did really exist, prevent its being noticed.

Should you deem the above question worthy a place in your Journal, I shall feel obliged by your insertion of it.

I remain, gentlemen, your obedient servant,

W. B. Honyman.

London, May 7th, 1828.

Generating and Purifying Gas for Illumination, upon a new Plan.

We formerly noticed Mr. Pinkus's improvements relative to the production of gas, by means of a simple apparatus, which is to be adapted to the fire-place of a counting-house, or a kitchen-range, in order to supply illuminating gas, for the use of the house and premises, immediately contiguous. This apparatus appears now to have been proved, and found fully to answer the expectations of the patentee; we shall, therefore, take an early opportunity of laying the plans before our readers, indeed, we only now withhold them at the request of the patentee, the foreign patents, which are in progress, not having been yet completed. The following is a paper presented to us by the inventer.

The superiority, brilliancy, and convenience of gas lights, having led to their introduction and use in most parts of the united kingdom, the attention of men of science, and capitalists, has been continually devoted to the formation and perfection of establishments necessary for ensuring extensive supplies of gas to the public, and adopting improvements to effect its purity. To attain the latter of these objects, various patents have been obtained, and numerous experiments tried: but, hitherto, the purest gas distributed, has been, when not in a state of ignition, extremely offensive; and when burnt in close rooms, frequently injurious to the health. It is also deserving of particular notice, that, notwithstanding the many improvements which have been effected, the numerous establishments which have been founded, and the remarkable extension of the use of gas, the public attention is now directed to the object of obtaining reductions in the price of that indispensable fluid.

The object of the patentee is, to form a Domestic Gas Company, to furnish, or, rather, to enable every householder, and occupier of premises, to supply himself with a cheaper, purer, less noxious, and more brilliant gas, than any which has yet been produced; not in the spirit of opposition to the opulent and respectable companies which have so long been established, but with that aim at fair and honourable competition, which must tend to the advantage of the public.

To prove the convenience and safety of the process, it is only necessary to state, that no additional fire-place or stove, will be necessary for generating the gas required, the operation being performed by the combination of a particular apparatus, with an ordinary kitchen-range, or other common fire-grate, so connected, as not in the slightest degree to interfere with its usual purposes, the superfluous heat being used to effect the object; the gas then passes through a refrigerator, and the patent purifier, into the gasometer, which may be placed in the cellar, or other convenient situation. The only attention which this process will require, will be for a short time (not half an hour,) in the morning, before the fire is lighted, it being so safe and regular, as not to need the slightest notice during the day or night; and as the residuum constantly returns to the retort, and is consumed, no nauseous remains are left to be disposed of.

The purification of the gas, is effected by a new method, the noxious odour destroyed, and the gas rendered inoffensive, pure, and brilliant.

Patents have been obtained for the mode and apparatus for generating, and for purifying gas, and very heavy expenses incurred in bringing the invention to complete perfection.

The patentee proposes to fix the apparatus on the premises where it may be required, at his own expense, and receive an extra remuneration for the first year only, according to the number of lights wanted; after which, he engages that the whole expense per annum, including patent right, shall not exceed one-half the present cost of gas supplied by the leading companies; but individuals may, in all cases, have the option of purchasing their right for a fixed sum, rated to the advantage of the purchasers.

It is conceived, that in towns and other places where gas establishments have not yet been formed, inns, manufactories, public works, and premises of various descriptions, the proposed Patent Domestic Gas Company will be able to render an important service, and confer an extensive advantage; and the proprietors beg to assure the public, that no exertion shall be spared, to render the invention worthy of the encouragement and support of this great commercial country. [*Lond. Jour.*

On the Condensation of Coal Gas.

To the Editors of the London Journal of Arts.

Gentlemen,—Manufacturers of coal gas, are not, perhaps, generally aware how much the process of *condensation*, contributes towards the *purity* of the gas.

Coal gas should not be subjected to the *purifier*, (that is, to a vessel containing certain ingredients having an affinity for sulphur,) until it has been first thoroughly cooled, or *condensed*, as it is termed, and divested of its tar and other oleaginous particles; and also of its hydro-sulphuret of ammonia. It contains these in great abundance, when first evolved, and, unless it be well condensed, will never get sufficiently rid of them. After being completely divested of these offensive ingredients, by condensation, the gas may then be slowly passed through the purifying vessel, to extract the *sulphuretted hydrogen*, and what remains of carbonic acid gas, &c.

The process of *condensation*, however important to the wholesomeness, purity, and even the brilliancy of gas, is still very indifferently understood, and imperfectly executed. In London, the mode of condensation generally adopted, is, merely to pass the gas through tubes, or between plates, which are merely cooled *externally*, by means of air or water. It must be admitted, that, if this method be pursued to a *certain extent*, and at a certain rate of expense for machinery, of course, according to that extent, the tar

and other oleaginous particles, as well as a great proportion of the hydro-sulphuret of ammonia, *will* be extracted; but it is a fact, which cannot be disputed, that, however expensive the vessels for condensation, (in most of the London gas works even) the condensing process has never yet been carried in any one of them, so far as to divest the cooled gas sufficiently, of its ammonia, either before or after passing through the purifier; and we well know that it is this very *ammonia*, which, when the streets are opened, or a leakage occurs, produces that putrescent effluvia, rendering *imperfectly condensed gas* so extremely offensive, and pernicious.

In the beginning of 1823, Mr. Tait, Civil Engineer, then in charge of the Bow Oil Gas Works, communicated to one of the directors of the city of London Gas Works, a plan, which he had conceived, of bringing the crude gas, *in immediate contact with the cold water, in the condenser:* thus proposing to combine the effect of the *temperature*, with the *chemical affinity*, which it is well known water has for ammonia. The idea was fully appreciated by the scientific gentleman to whom it was imparted, but not at that time put in execution. In 1825, however, Mr. Tait, having been sent down to Ayr, in Scotland, to erect gas works there, for the British Gas Company, constructed a *condenser*, on the above-mentioned principles. The gas made at Ayr, has been tried by several individuals, (perfectly competent to judge of the purity and quality of carburetted hydrogen gas,) and they have invariably declared *it to be the purest and best gas they have ever examined.* The superiority of the gas here, is chiefly ascribed to the effect of the very excellent condensation. At Dalkeith, Mr. Tait has since constructed a similar condenser; but the works there, having fallen into an imperfect management, and ignorant hands, cannot, of course, be referred to, as proving in one way or another.

I am, gentlemen, yours, &c.

Edinburgh, 16th June. X.

We have been promised a drawing and more minute description of Mr. Tait's improved condenser, (as erected at Dalkeith,) which we shall have much pleasure in submitting to our readers when it arrives. [*Editor Lond. Journ.*

Observations on the Luminous Appearance of the Sea.

Mr. Finlayson, in his "Mission to Siam and Hue," has the following paragraph relative to the luminous appearance of the sea near Prince of Wales' Island:—

"Nothing is more singular in these seas than their phosphorescent appearance by night; the ocean showing, like a vast lake of liquid fire, melted sulphur, or phosphorus. In many bays, such as the harbour at Prince of Wales' Island, the bodies which emit this singular light, exist in such vast quantity, that a boat may readily be distinguished at the distance of several miles, by the brilliant light, re-

sembling that of a torch, proceeding from the water, agitated by her bow and oars. We have seen the sea rendered of a green colour and slimy appearance, by day, so that it might have been mistaken for the green vegetable matter common on stagnant pools. We have taken up a quantity of this green-coloured water, and, by keeping it till night, have ascertained, that the green colour by day, and the phosphorescent appearance by night, were occasioned by the same substance.

"The causes of this luminous appearance in the sea, are, doubtless, various in different parts of the ocean. We know that fish, when dead, afford a similar light; and experiments have shown, that dead fish immersed in sea-water, after a time, afford it also. The spawn of fishes is said to afford it, and putrefaction is considered as a very common cause of this appearance. In the present instance, it appeared unequivocally to proceed from innumerable granular gelatinous bodies, about the size of a pin's head. These, when taken upon the hand, moved about with great agility for a second or two, when they ceased to be luminous, and remained immoveable."*

[*Lond. Journ.*

On Tinning Cast-Iron Weights. By M. Bigou.

From the 'Industriel,' and Gill's Technical Repository.

These are first to be well rubbed and cleansed in a bath of sulphuric acid, (*oil of vitriol*) which has been diluted with a proper quantity of water. After this preparation, they are to be dipped into water, in which sal-ammoniac has been dissolved, in the proportion of one-seventeenth of the salt, to the quantity of water employed. During these operations, we melt fine and pure tin, with which has been previously mixed copper, in the proportion of three ounces of this latter metal to one hundred pounds of the tin. When the mixture has been melted at a proper degree of heat, not so high, however, as to hinder it from attaching itself to the pieces of cast-iron to be tinned, they may be plunged into it.

The weights should be previously turned into shape, in the lathe, and be made smooth before tinning them; and when they have become cold, after the tinning process, they may be polished in the lathe by means of burnishers in the usual manner.

In order to render the three ounces of copper easily fusible in the tin, it should be previously melted with six pounds of that metal, taken from the one hundred pounds.

This tinning of the weights is designed, not only to preserve their size and weight better, but also to prevent them from rusting; and we can thus substitute these cheap cast-iron weights, in the room of the more expensive ones of brass or copper.

* This was to have accompanied Lieut. Ingall's article on the same subject, in the last number.

On rendering Platina Malleable; as practised at St. Petersburgh. By M. J. Eichfeld.

From the "Journal d'Odessa," for August, 1827.

In France, before the year 1810, in order to render platina malleable, it was melted with white arsenic, (the deutoxide of arsenic,) the ingots were then heated in a violent fire, in order to volatilize the arsenic in part; they were next impregnated with oil, and again heated, in order to volatilize the remainder of the arsenic. After this, they purified the platina, by dissolving it in the nitric acid, and then boiled it in distilled water, before subjecting it to the action of the hammer; but they abandoned this process, as it required too much time in the different heatings. Since 1825, indeed, M. Breant has worked platina, but by means which are unknown. We now obtain a considerable quantity of this metal from the Uralian Mountains, in Siberia; and the *Corps des Mines*, at St. Petersburgh, have made many different trials to render it malleable. Last summer they conducted the process in the following manner:—they took the crude platina in grains, and separated the iron it contained, by means of the magnet; they then dissolved the remainder in *aqua-regia;* and after the solution had become cold, filtered it, and added to the liquid a solution of the hydrochlorate of ammonia, which produced a yellow precipitate, formed by the hydrochloric acid, the platina, and the ammonia. This precipitate they washed repeatedly; and when dry, it was calcined in an earthen vessel. It then acquired a spongy consistence, and was the purified platina. They afterwards boiled this spongy mass in a little hydrochloric (muriatic) acid, washed it in hot water, and dried it. The mass thus prepared, was placed cold, in an iron mould of a convenient size; and either round, or of any other form; but the round or cylindrical mould, is the most manageable. They next compressed the platina in the mould, by the aid of a powerful screw-press, which produced a compact plate having a metallic lustre. This plate is not, however, malleable; to give it this property, it is heated to whiteness, and in this state is again submitted to the action of the press, when the mass becomes united, and gains a perfect ductility.

Since this invention, the directory of the mines has permitted this malleable, as well as the crude platina, to be sold. Those persons who desire to possess it, may apply to the *Corps des Mines*, at the Mint of St. Petersburgh; the following are the prices fixed:—the metal in its crude state, is three roubles (82 13) the zolotnic (66 gr. Troy;) in the purified and spongy mass, at four roubles; and in ingots, bars, wire, &c. at five roubles. The ingots and bars may be had of any required sizes. This malleable platina serves for making chemical vessels, various instruments, and other vessels; also for teapots, knives, cooking utensils, watch-chains, &c.

Note.—This process is not new; it is known and practised in France; and has also been known and used in this country for upwards of twenty years, although nearly kept secret, and in but few hands. [*Editor Tech. Rep.*

On an improved Surgical Instrument Maker's and Cutler's Mill. By THOMAS GILL, Esq.

THE Editor saw, a few days since, in the city, a surgeon's instrument maker, polishing lancet blades on a tool driven in a mill worked by himself, with a considerable velocity; and thus completely avoiding the expense of having a turn-wheel to pay, as usual.

The mill was contained within and supported upon a wooden frame, about four feet high, three feet wide, and six feet long; firmly braced to the floor, and strengthened by iron bands; but it would have been much better had it been mounted upon a firm cast-iron frame. Near the front end of the mill, a cast-iron band-wheel, similar to that of a foot-lathe, of three feet in diameter, and with a heavy periphery or rim to it, and light arms, was mounted upon an axis, with a cylindrical neck or pivot at each end of it, and having a double crank formed upon it, the necks of which were placed in opposite directions to each other, and a hook was hung upon each neck, descending to two wooden treadles, turning at their back ends, upon a cylindrical rod passed across the frame, and having staples driven into the upper sides of them, into which, other hooks, formed at the lower ends of the crank hooks, were passed; these treadles at their outer ends, came within convenient reach of the feet of the workman, who was seated upon a bench laid across two sloping supports, projecting from the two front ends of the frame, and who could thus communicate *two impulses to the wheel at each revolution of it;* and also govern its motion so as to cause it to move quicker or slower at pleasure. In order still further to increase the velocity of his grinding, glazing, and polishing tools, a leather band was passed from the band-wheel around a small rigger or band-wheel, about five inches in diameter, from which another leather strap or band was passed around the pulley which was affixed upon the right-hand end of the spindle of each grindstone, glazer, or polisher, and which pullies varied in their diameters, according to the greater or lesser velocity with which the different tools required to be driven. The larger band-wheel was so placed, as just to escape rubbing against the workman's knee, and the spindles carrying the different tools, were mounted at the front end of the frame; and, indeed, the whole disposition of the parts, was most judiciously contrived, so as to save room in the workshop, and to perform their work in the most complete manner. The spindles upon which the grindstones, glazers, and polishers were hung, had, as usual, sharp conical points at their ends, and ran in holes made in wooden adjusting blocks in the same manner as they are commonly employed: and the necks or pivots of the two other axes ran upon hard steel hollowed plates.

Besides rendering the workman at all times perfectly independent of the caprice or irregular attendance of his turn-wheel, the absence of whom frequently causes delay and much loss of time; the room saved in the workshop, from the removal of the large band-wheel and its cumbrous frame, is a great advantage indeed. The workman

stated, that the power required to drive his mill for grinding, glazing, and polishing small works in cutlery, such as lancets, and other delicate surgeons' instruments, instruments for operating upon the eye, penknives, &c. was very trifling; but that in grinding razors, or still larger instruments, it was considerable; in this case, however, he was able to avail himself of the occasional help of an assistant, who, seated upon the bench behind him, could operate with his feet upon the outer end of the treadles, and thus render the labour comparatively light.

A water trough was supported upon hooks resting upon the top rails of the frame, with a splash-board in it, secured by a wedge, as usual in grinding articles of cutlery.

We hope that mills similar to the above, may now become more common than has hitherto been the case; and think that they may be applicable to a great variety of other purposes, than merely the grinding, glazing, and polishing of cutlery. Our description is, we believe, sufficient to enable any workman of competent skill, to construct them; but we may, possibly, hereafter give a figure of one of them, which will remove every difficulty therein. [*Tech. Rep.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS GRANTED IN AUGUST, 1828.

With Remarks and Exemplifications by the Editor.

1. For an *Hydrant Fountain;* Lewis Goulay, Philadelphia, Penn. August 1st.

The object of this invention is, to cool, and preserve in that state, the river water supplied by the public water works in large cities.

A cast-iron vessel is made to contain the water and the ice: this vessel consists of two concentric cylinders, having one common bottom. The outer cylinder is proposed to be 12 inches in diameter, and the inner, 6 inches; the former is to contain water, admitted from the water works through a pipe at the bottom; the latter is to contain ice, wrapped in flannel. A lid is made to fit firmly within the outer cylinder; this is to be fixed by soldering, to render it air tight, and to enable it to resist the pressure of the water. A separate lid covers the ice chamber; a cock is inserted for the purpose of drawing the cooled water from the outer cylinder, or reservoir, which is simultaneously supplied from the water works. A hole is left in the bottom of the ice chamber, for the escape of the drippings. Provision is made for cleaning the reservoir, occasionally, by the rushing in, and discharge of the water. The patentee claims,

"1. The principle of applying ice to water for the purpose of cooling the latter, without bringing either of them in contact."

"2. The modifying of the temperature of the water at will, by the adaptation of *iron*, for the reservoir, or fountain, (a well known sweetener and purifier of that fluid) and the exclusion of the atmospheric air, so that the natural water coming from beneath, may be

introduced in any quantity, to decrease the degree of cold, or excluded, to increase it."

"3. That in the machine, but 3 cents worth of ice per day, will keep three or four gallons of water constantly in a state of coolness, fit for use; for as much as is drawn out, is instantly replaced, to be acted on by the ice."

"4. That the reservoir, or 'Fountain,' as it is called, of the machine, is, in Philadelphia, and other cities, through the hydrant pipe, applied by my principle, constantly kept full."

"5. That the ice has no connexion with the water whatever, and communicates to it none of its dirt; it is preserved, by the air being excluded from it, when in the jar."

We apprehend, that the *principle* of cooling water by surrounding it with ice, is the same as that of cooling wine by the same means, and that the *practice*, in both cases, has been a very common one.

Would it not be an improvement to surround the vessel by a substance which would neither conduct, or absorb heat, so readily as the cast iron?

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2. For a *Signal Lamp;* Joseph Feinour, and Joseph Feinour, Junr. Philadelphia, Penn. August 1st.

The patentees state, that the ordinary signal lamp used at sea, is a foot in diameter, and 18 inches high; is covered with transparent horn, which is liable to injury, as it cracks readily, or may be burned by the flame of the candles usually employed in them. Their new signal lamps are only 4 inches in diameter, and 9 inches high; they are made either square, or with six or eight sides. A lamp, with two wicks, is firmly fixed to the bottom; in this, $1\frac{1}{2}$ gills of oil will give a brilliant light for 12 hours. The lamp is glazed on each side with a double convex lens, of from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches thick, with many squares on their surfaces, which serve to magnify, refract, and disperse the light. The patentees state that "by these means this lamp will throw a light at the mast head, which may be seen *seven miles off:* a man may be distinguished by it 30 yards off; and at the distance of from 15 to 20 feet, a person may read by it.

"The inventors claim in this as original, the adaptation of a double convex lens with squared surfaces, to the lamp case, and the general construction of the case," as described.

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3. An improved *Washing machine;* Simon Willard, junr., Cincinnati, Ohio, August 2.

The description of this machine is of considerable length, and is complex. The drawing accompanying it, does not render the construction very clear; should we hear of its *washing its way into favour* with the laundresses, it may again claim our attention, otherwise we shall allow it to rest with its brethren.

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4. An improvement in the mode of *Raising and lowering*

canal boats, on inclined planes; William Knight, Morristown, New Jersey, August 5.

The importance of the subject of inclined planes is such, as to demand our particular attention to every thing which presents itself in the form of an improvement. If, upon a more careful examination of Mr. Knight's specification, we think that his plan can be understood without drawings, we will make an abstract of it in our next number; otherwise it shall hereafter be illustrated by engravings.

The main feature of his plan is, to raise and lower the boats, floating in a car, supported upon numerous wheels. The car to have water-tight gates at each end, one pair of which is to be opened to allow the boat to float in, or out, at the lower level; the other pair to be opened to allow the boat to pass in or out, at the upper level; there being leather valves, &c. used to make the car fit water-tight against the entrance, or mouth of the canal, at the upper level, previously to opening the respective gates which close the end of the car, and the entrance of the canal.

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5. For a *Thrashing machine;* Matthew Barney, Nantucket, Mass. August 5.

This machine is, in form, somewhat like the common horse gin. There is an upright shaft, with a bar projecting out, to which the horse that turns it is attached. Three arms, eighteen feet long, and fourteen inches wide, are passed through mortices, so as to form six radii from the centre of the shaft: these are connected together by six pieces of plank, each passing from the lower edge of one arm, to the upper edge of the next arm, and, consequently, forming six inclined planes. Eight flails, or thrashers, eleven feet long, work side by side, upon one common pin; their short ends, three feet in length, pass under the wheel, and are tripped by it as it passes round; the whole making 48 strokes in each revolution.

The grain is placed upon a table standing under the outer ends of the thrashers; this table traverses backwards and forwards, by means of a windlass. The patentee says, "by placing flax or hemp on said table, I believe it will break it equal, if not better, than any other way."

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6. For an improved mode of *Constructing breakfast and dining tables;* Peter Barker, Worthington, Franklin County, Ohio, August 6.

The dining table is to be circular; in other respects it may be like the ordinary dining table. A second circular table, or platform, precisely like the top of an old fashioned round tea table, is to be placed on and over the centre of the dining table, it being kept in its place by a pivot, or axle, upon which it turns. This centre, or upper table, is to be sufficiently small to leave room for plates, knives and forks, upon the lower table, whilst the various dishes are placed upon the upper one. The object is, to enable each person, by turning the upper table, to bring before him the dish which he desires.

7. For a *Curvilinear saw mill;* David Barker, Ipswich, Mass. August 6.

In this machine, the saw is made to move about the work, by means of an ingeniously contrived apparatus, denominated the gauge plate, which will guide the saw into any curve ordinarily wanted for ship building, and for many other purposes. We have a drawing of this apparatus in preparation.

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8. For an improvement in the *Machine for reaping and thrashing grain;* Samuel Lane, Hallowell, Maine, August 8.

This patent is for improvements upon machinery formerly patented. The combination of reaping and thrashing, appears rather incongruous; but the inventor has contrived, with great ingenuity, to apply a large portion of the machine for reaping, to the purpose of thrashing, so as to include the whole in one patent. He has, also, a roller, and other appendages, moved by the same power, for the purpose of shelling corn. No clear idea of the machine can be given, without numerous and complex drawings, to which the specification refers throughout.

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9. For an improvement in the construction and application of the *Quadruple forcing pump;* Ira Ferris, Ellicott, Chatauque County, New York, August 12.

This purports to be an improvement upon a double forcing pump invented, and formerly patented, by Ira and Thomas Ferris. It claims to be applicable to the raising, and discharging water for hydraulic purposes, to be applied to propelling mills, &c. in still water, such as lakes and ponds.

There is one ascending main; this is surrounded by four *forcing* pumps, which are filled through lower valves in the ordinary way, each of these has a communication with the ascending main, with valves to prevent the return of the water. The four pumps are worked by cranks upon a common shaft. Above the ascending main, is a large reservoir, or floom, to receive the water which is forced up. Below this reservoir is a water-wheel, which is to be kept in motion, by opening a gate at the bottom of the reservoir; in order to fill this, in the first instance, the pumps are to be worked by horse, or other power; *but when once filled, it is to supply water enough to turn the water-wheel with sufficient power to replenish itself, and to drive mills, &c.*

Neither our scientific readers, or practical mechanics, will ask us to extend our remarks upon this power-gaining apparatus; or wish for the minor details, of the gearing, connecting rods, &c.

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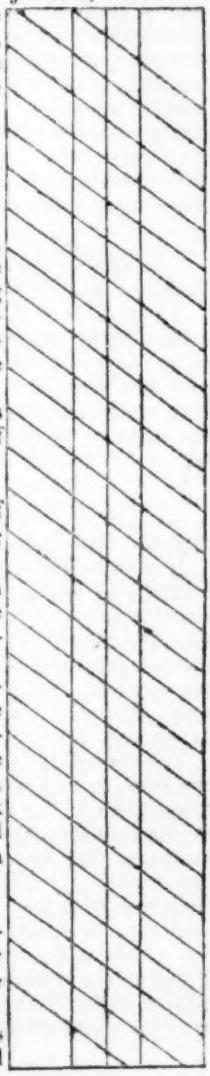
10. For *Propelling vessels* in the water; Hull Case, Huron County, Ohio, August 13.

This patent is taken for a scheme which has been repeatedly tried, and as repeatedly failed. The present patentee, however, assured

us, in conversation, that he had fairly tried the experiment, and that he is confident he can ascend against a current, and head wind, *by the force of the wind itself.*

He places a horizontal shaft across the vessel, which carries paddle wheels, like those used in steam boats. An upright shaft is eared into this horizontal one, by bevelled wheels: this upright shaft has projecting arms, which support four jib-sails, which are fixed in a manner very similar to those of some of our horizontal wind-mills, and which will turn, by the wind, be it in what direction it may. The force of the wind upon these sails, is to be the propelling power.



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11. For a method of obtaining *Ruled stereotypical writing paper.* Cayetano Lanuza. New York, August 13.

This patent is for printing ruled lines upon writing paper, with faint, blue, printing ink. The specification says, "the method of ruling writing paper, by means of wooden moulds, or stereotypical plates, and a printing press, is the improvement which I claim as made by me in the art of ruling writing paper."

The margin shows one, among the samples lodged in the patent office, with the exception of being printed with common typographical ink.

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12. For an improvement in the mode of *Fitting the hammer heads of piano fortes;* John Mackay, Boston, Mass. August 14.

The patentee says, "my invention consists in letting into the top of the hammer heads, a piece of lead, pewter, solder, zinc, tin, iron, composition of metals, or compound of metals."

"The advantages resulting from said invention and improvement, are as follows, to wit; the hammer head having any of these kinds or composition of metals inserted in the tops of the hammer heads, and then covered with leather, or any other covering, produces, when struck against the strings, a much stronger, fuller and firmer tone than that produced by the common mode of hammers."

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13. For an improved *Washing and pressing machine* for cleansing clothes; Henry Averill, Richland, Oswego County, New York, August 14.

In many particulars, this machine resembles several which have been already patented, and

the patentee does not distinctly inform us what he claims as new. A drum or cylinder is made to contain the clothes to be washed; this has circular ends of solid plank, but the sides are formed of about forty rounds, placed at about ½ an inch apart. Four additional rounds are placed within these, two on each side, diametrically opposite to each other. These are to carry the clothes to the vertex, from whence they fall, as the drum revolves. The drum is contained, and is turned by cranks, within a trough, the bottom of which is semicircular. Three or four wooden balls, about three inches in diameter, are put into the drum with the clothes, to assist in cleansing them. Over the trough of the washing machine, is placed a smaller trough, in which the clothes are to be pressed, instead of wringing them. The bottom and sides of this trough are perforated with many holes. The clothes being put into this box, a *follower* is forced down upon them by means of a lever and windlass, and the superfluous water runs through the holes into the lower trough.

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14. For a *Roller printing press,* for printing from types; Joshua Laird, Pittsburgh, Penn. August 16.

The *form* is to be placed upon a platform, and passed between two rollers, in the manner of copper plate printing; or several forms are to be ranged on the same platform, and a suitable roller is made to pass over them, and to press with sufficient force to print the sheets. The patentee is aware that rollers have, heretofore, been essayed for the same purpose, and, therefore, claims only his arrangement, or manner of fixing the roller.

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15. For an hydraulic apparatus for *Propelling boats* or other vessels. Benjamin Phillips, Southwark, Philadelphia, August 16.

Numerous contrivances have been made, to cause the valves, or buckets, by which vessels are propelled, to stand vertically, and, sometimes, to move horizontally through the water, under an impression that the oblique direction in which they dip and emerge, produces a great loss of power. Without touching the main question, we may aver, that whilst some of the plans proposed have manifested much ingenuity and science, no one of them has, hitherto, proved in practice, equal to the ordinary wheel.

The plan of the present patentee is, to hang hinged buckets along the sides, or in a well, or between twin boats; a reciprocating motion being given to the slide to which they are attached; when moving towards the stern, they are to open out perpendicularly, when towards the bows, they are to collapse. The following is extracted from the specification. "These valve buckets shut and open as they meet resistance from the column of water, forming right angles with the resistance, or centre, or parallel lines, when drawn forwards, with the middle of the vessel," offering no resistance, or partially so. These valves or buckets are moved on the longitudinal shaft, in like manner as the frame of an umbrella, or parasol, is opened, or hoisted upon the stick; or, in other words, act on the same principle as the

valves in a pump box, and may be constructed in a well, or cylinder, of wood, or metal," &c.

In the drawing accompanying the specification, the structure of the several valves, or buckets, is shown; they, in general, bear a strong resemblance to the *duck foot* valve, which is known to those conversant with the subject; the manner of working the valves is well expressed by comparing it with the 'opening and closing of an umbrella,' as there are tubes sliding upon a bar, with an arm, or stretcher, from them to the valve or bucket, with stops upon the bar, to regulate the angle to which they shall open and close.

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16. For an improved *Check and plaid power loom;* Enoch Burt, Oliver D. Boyd, and Amos H. Boyd, Manchester, Hartford County, Conn. August 19.

This cannot be described without an engraving, which will be procured. The patentees claim, "the shifting of shuttles to form any figure, without interrupting the motion of the power loom; and the stopping of a power loom by the breaking of a bobbin thread, or by the bobbin running out, from the bobbin thread being made necessary to prevent the loom from stopping, through its action on a slider, or lever."

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17. Improvement in the horizontal wind mill; Walter Ingalls, Strafford County, New Hampshire, August 19.

From the specification, it appears evident that instead of an actual wind mill, the model made for the office, was the subject of description, the numbers, therefore, must be taken as expressing proportion only. The mill is to be similar in its general structure, to some already known. There are to be four sails, the frames of which are to be "*eight inches in height and four inches in width*, that have canvass nailed unto them; they stand upright, and turn upon gudgeons between the top and bottom arm." These frames have check cords, to prevent their turning outwardly, and there are spiral springs, two to each frame, to prevent the cords from breaking by any sudden jirk. A cog wheel on the vertical shaft, meshes into a pinion on an horizontal shaft, which carries a fly wheel. "The balance wheel is *fifteen inches in diameter*, is made very similar to the common water wheel; the diameter of it on the inside, is about 10 inches, which will, of course, make the rim of it five inches in depth, and is *two and a half in width*. The bend of the wheel on the inside and outside, is planked, so that it is hollow. This hollow is partitioned off in spaces of one inch and a quarter, and in these spaces I put *clay*, which is for the purpose of making the wheel heavier." The specification concludes thus. "What I claim as my improvement, is, the balance wheel, the manner in which it is made heavy, and the spiral springs."

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18. For a machine for *Sawing hoops, lath, veneering, staves, and heading*, and all other kinds of stuff used, or wanted by

coopers, cabinet makers, and house joiners; Isaac Price, jun., Lockport, Niagara County, New York, August 19.

The drawing accompanying the specification of this machine, gives a general, but not a particular idea of its structure. We will merely state, that there is a carriage, upon which the timber to be sawed is fixed; that there are revolving shafts, which carry circular saws, and that these saws may be placed so as to saw vertically, horizontally, or obliquely, in any required degree. What particular part of the structure is claimed as new, does not appear, the whole machine being described, without any special specification.

It is stated, that the whole machine will occupy a space of only 12 feet in length, five in width, and 3 or 4 in height, and that it may be constructed for seventy-five dollars.

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19. For an improvement in *Raising water from wells*, cisterns, and springs, for domestic purposes; Samuel Smith, Mendon, Monroe County, New York, August 20.

This resembles a pump, with a solid piston. The chamber or reservoir, is to be fixed in any place where water is wanted; a pipe, with a valve at top, leads down into the well or spring. In the description, no proportions are mentioned; in the drawing, the chamber has ten times the diameter of the suction pipe, and, of course, the water must pass through this with 100 times the velocity with which the piston ascends. To draw off the water, a cock is inserted through the lower part of the chamber; as the water is discharged, the weight of the piston, and the pressure of the atmosphere, will cause the piston to descend, and occupy its place.

The most curious part of the structure, is the mode of working the pump. The piston rod is a toothed rack, into which a pinion works. This pinion is on the same axis with a wheel of three times its diameter, and this wheel is turned by a crank on the axis of a second pinion, which is about the size of the first; the piston will, of course, rise very slowly; this is evidently intended to accomplish the labour of filling the large chamber, which is to act as a reservoir; but why a single small pinion and crank were not preferred, we do not perceive.

The water is not to be raised by alternate strokes of the piston, but by a single lifting operation, which is to be repeated, when the cistern, or chamber, is exhausted.

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20. For a method of *Casting moveable printers' types;* whereby the process is rendered practicable by mechanical means, and its expense much abridged; Wm. M. Johnson, New York, August 21.

The description of the apparatus and process, which form the subject of this patent, is of great length, occupying upwards of thirty closely written pages; besides which, there are about twenty well delineated figures, with seven pages of descriptive reference. The con-

cluding part, in which the patentee states his claims, will afford a pretty full and clear idea of the nature of the invention.

"The improvements which I claim by right of original invention are,"

"1st. The giving to the mould, by the turning of a crank, all the motions that are requisite in it in casting, viz. the opening and shutting the mould with proper force and accuracy; the raising of the matrix, and the discharging of the type; said operations of the mould being performed by means of the mechanism above described, or by any other that merely varies the form, without improving the process."

"2ndly. The performance of all the motions of the kettle apparatus, by the turning of a crank, viz. the producing and stopping of the stream of metal through an aperture in the kettle, and giving it the needful force; this operation being performed by means of the mechanism herein described, or by any other that merely varies the form, without improving the process; not intending to embrace within this claim, the use of a stopper alone, or a plunger alone, but the use of the two together, when worked by a crank."

"3dly. The use of a moveable cover, to the cavity of the mould, by means of a distinct piece coming between the kettle and the mould, to prevent the metal from overrunning it when forced into the mould; this appendage being applied in the manner afore stated, or in any other that merely varies the form without improving the process."

"4thly. The covering and uncovering the cavity of the mould (with the said cap or cover) by the turning of a crank; this action being effected by means of the mechanism afore described, or by any other that only varies the form without improving the process."

"5thly. The application of water to the mould, by a rapid dropping, or constant stream upon it, whilst casting, when worked by a crank, as afore described; and also the application of water to the cap, by the means above stated, or by any other that merely varies without improving the mode; it is not intended in the claim, to embrace the use of water to the mould in all shapes, but merely its use by a *constant passage* of it when applied to one side of the mould alone, and when applied to the cap, or to the two sides of the mould together, by any kind of a stream or passage of it, or by any means that merely varies without improving the mode."

"6thly. The combined use of the plunger with valves, and a stopper rod, in a stationary kettle, that has the fire around it; said plunger and stopper being attached to the kettle in the manner afore stated, or in any other," &c.

"7thly. The use of compressed atmospheric, or other air upon the surface of the melted metal, to give it the needful impetus into the mould, said power being applied in the manner herein described, or by any other," &c.

"8thly. The combined action of the mould, cap, stationary kettle, plunger, and stopper, or air pressure, in lieu of plunger and water, by means of a crank as afore specified, or by any other," &c.

"It is intended, in this particular claim, to embrace only the *com-*

bination of the several parts, as affording, in their united operation, a new process, and a certain degree of improvement."

"9thly. The removing the mould from the kettle, in order to discharge the type by causing an immediate separation between the two, by taking the mould off from the kettle in a line with the direction of the stream of metal that is injected into the mould, or at any angle with that line, without having any sliding upon the surface of the kettle, or other friction against it, further than that produced by the taper point of the spout, in contact with the hole of the cap."

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21. For improvements on a *Boiler or steam generator;* patented on the 13th of March, 1815; Lemuel M. Richards, Chagrin, Cayahoga County, Ohio, August 21.

The patent obtained in 1815, upon which this purports to be an improvement, was principally for the purpose of generating steam for mashing and distilling. The boiler there described, is a metallic vessel, ordinarily made 7 feet long, 2 feet 6 inches wide, and three inches deep. This is built around with brick, in the usual manner; and a steam pipe ascends from it, communicating with the beer tub, doubler, &c. Two tubes extend along under the boiler, inserted into it at each of their ends, which tubes are exposed to the flame from the fuel, the better to economize heat. The furnace is in front of the boiler: the wood used is placed upon iron bars, which are themselves hollow tubes, and kept filled with water, by a supply tube into which they are inserted at one end; the other ends of these tubes pass through the brick work of the furnace, and into a tub where the water is heated for mashing. The steam, and supply, tubes, need no further description.

In the recent improvement, instead of a single boiler, there are two, one placed about 8 inches above the other, and connected together by two tubes of iron: the bars for heating the mashing water, are enlarged, and their projecting ends open out, to receive short wooden tubes, which connect them with two wooden hollow logs, which run parallel with the boiler, on the outside of the fire place. This connexion is secured by passing iron bolts, with heads and screw nuts, through the logs, the connecting wooden tubes, and the hollow bars of the grate. Wooden tubes from these logs, enter, the one through the top, and the other through the bottom, of a tub, which is to supply boiling water for mashing, &c.

The fire is placed under the lower boiler, and the flame passes back between it and the upper boiler, then over the upper boiler, and into a chimney. There is a safety tube, rising to the height of 18 feet from the upper boiler; and the manner of supplying the boiler with water has undergone some change. These are the improvements claimed.

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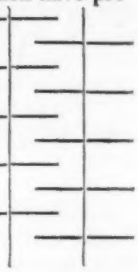
22. For the *Manufacture of entry and carriage mats* from Manilla, Sisal, and other grasses, and from hemp; Samuel S. Williams, Roxbury, Norfolk County, Mass. August 21.

[See the specification in this number.]

23. For a *Churn for churning milk and cream*; Joseph Hathaway, Canandaigua, Ontario County, New York, August 22.

There is, we believe, a real novelty in this churn, notwithstanding the great number of machines for the same purpose which have preceded it. The body of the churn is a barrel, which is placed upon one end; within this barrel there are two sets of dashers, which are made to revolve in opposite directions, and work between each other in the manner represented in the margin. There are two small whorls on the upper ends of the shafts of the dashers; there are also two larger whorls, which are turned by a crank, the bands from which pass over the smaller whorls, and turn them in opposite directions. The manner of fixing the frame, shafts, whorls, and bands, needs no description.



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24. For a machine for *Planting grain, and other seeds;* Orson Starr, Richmond, Ontario County, New York, August 22.

Of this machine, the description and drawing shall appear in our next number.

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25. For an improvement in the *Manufacturing or making of shingles;* Danforth Wilder, Rome, Oneida County, New York, August 25.

A circular stationary platform is erected, of 16 feet, or more, in diameter, which is the foundation, or bed of the whole machinery. A strong pivot, or gudgeon, projects up from the centre of this bed, and near its periphery there is a strong knife, placed with its edge as high above the platform as the intended thickness of the shingles. Under the edge of the knife, the platform is perforated like the stock of a plane, to allow the cut shingles to pass through. A wheel, equal in diameter to the platform, is made to revolve upon the pivot or gudgeon on the centre of the bed. This carries boxes in which the blocks, from which the shingles are to be cut, are secured. A lever or arm extends out from this wheel, to which a horse may be attached; or the wheel may be turned by water, or other power.

There are some appendages for bringing the block forward, and letting it down to the knife, which are not distinctly delineated in the drawing, or clearly explained; and the model has not yet been deposited in the office.

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26. For an improvement in the *Machine for boring the earth;* John H. Failing, Canajoharie, Montgomery County, New York, August 25.

By the aid of this machinery, horse power is to be applied to the purpose of boring the earth. The horse turns a vertical shaft in the ordinary way, and by means of some ingeniously contrived apparatus, the rope to which the drill shaft is attached, is alternately drawn

and slackened so as to raise the drill about ten inches, and allow it to fall, about 60 times in a minute.

The points claimed by the patentee, are, the single ratchet wheel and lever, for tripping the drill rods; a metal valve placed at the bottom of a cleaner, which is a metal tube fitting the hole which has been bored, and let down to remove the drillings; a cast steel collar to the chisel, which collar is put on the shank of the drill before it is inserted into the socket, and projects precisely enough to cover the outside edges of the drill; and the manner of causing an endless screw to operate in the raising the rods from the earth, by horse power.

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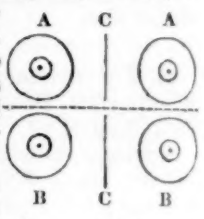
27. For a machine called a *Slitting gauge, for slitting lath, hoops, and all other kinds of stuff*, from boards, or other stuff; Benjamin K. Crandell, Lockport, Niagara County, New York, August 25.

This machine has a long flat table, or bench, mounted on a proper frame. An axis passes across, under the bed of the table, carrying at one end, a large cog wheel outside of the frame, and, a drum, or whorls, round which bands may be passed, to give motion to circular saws, &c. A A and B B, represent small cog wheels on the ends of two pair of rollers, which are fixed above, and across the table. The lower wheels B B, are turned by the large cog wheel, and these turn the upper wheels A A. The board, or stuff, to be slit, represented by the dotted lines, is passed between the rollers, and is cut by rows of knives above and below the board, as at C C. These rollers have steel or iron points driven into them, to draw the stuff through.



The stuff is sometimes prepared for slitting, by the use of a circular saw, or saws, which may be carried by straps from the drum. When these are used, a carriage is placed upon the bench; upon this carriage the stuff to be sawed is secured, and is run backward and forward by hand.

The machinery receives its motion by applying the power to the shaft of the cog wheel and drum.

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28. For an improvement in *Boot-trees;* Henry B. Miller, Mayville, Chatauque County, New York, August 25.

This improvement consists in an iron shaft which passes down the boot-tree, and has on its lower end a toothed wheel, or cylinder, which takes into a toothed rack; by turning this shaft, the back and front pieces of the boot-tree are forced apart to any desired extent. At the upper end of the shaft, there is a ratchet wheel and catch, to hold the shaft in its position, when the boot is stretched. These appear to be the essential parts of the invention.

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29. For an improvement in the mode of *Managing honey*

bees; Francis Kelsey, Lockport, Niagara County, New York, August 26. [See the specification in the present number.]

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30. For an improvement in the *construction of filters,* for separating the impurities from turbid liquors; John S. Phillips, Philadelphia, Pennsylvania, August 27.

Some additions are intended to be made to this invention, which will, probably, be the subject of a future patent, when the whole shall be particularly noticed.

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31. For an improvement in the *Mode of drawing lotteries;* J. J. Cohen, jun., Baltimore, Maryland, August 28.

The object of this improvement is, to have "a lottery composed of several drawings, each drawing, although part of, and included in the principal programm, yet independent and separate."

Suppose, for example, that the different classes of a certain lottery are to be drawn monthly, it is intended to subdivide each class, so that a portion of it shall be drawn weekly, and the whole completed in four drawings. In a case of this description, it is obviously necessary so to arrange the scheme, that an equal interest may be excited, and maintained, by each separate distribution. This is the object proposed to be attained by the exemplified scheme given in the specification. This we do not think it necessary to publish. Those interested, will learn the whole from the publications of the patentee.

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32. For a *Machine for planting different seeds;* Austin H. Robbins, and Levi Robbins, jun., Denmark, Lewis County, New York, August 28.

The drawing for this machine is in the hands of the engraver, and is expected to be ready for the next number.

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33. For an improved *Water-proof self-priming percussion gun-lock;* Samuel S. Faries, Middletown, Butler County, Ohio, August 29.

[See the specification in this number].

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34. For a *Self-regulating brake* for wagons, carts, or carriages; Robert Turner, Ward, Worcester County, Mass. Aug. 29.

This will hereafter be published with engravings. The object, as the name indicates, is to cause a brake to act, by the descent of a carriage upon a hill, or an inclined plane, so that its friction shall be proportioned to the descent, without requiring the care of an attendant.

35. For a *Machine for sawing staves*, for the construction of cylindrical vessels; Lewis R. Bump, Wareham, Massachusetts, August 29.

This machine consists of a hollow metallic cylinder, or tube, of the diameter of the intended hogshead, cask, tub, bucket, &c., and somewhat exceeding it in length; one edge of this cylinder is toothed, so as to form a saw; the other end is closed by a cylindrical piece, or head, fitted firmly into it; into the centre of this, an axis, or shaft, is fixed, which passes through, and beyond, the axis of the cylindrical saw. Upon this axis the saw is made to revolve. The timber to be sawed, is fixed upon a proper carriage, and cut both convex and concave, by being forced up against the saw.

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36. For an improvement in the mode of *Manufacturing paper on machines*, by combining two or more thicknesses of paper into one sheet; Richard Waterman and George W. Annis, Providence, Rhode Island, August 30.

See the following specification.

SPECIFICATION OF AMERICAN PATENTS.

Specification of a patent for an improvement in the manufacture of paper, by combining two or more thicknesses of paper in one sheet. Granted to RICHARD WATERMAN, *and* GEORGE W. ANNIS, *Providence, Rhode Island, August 30th.*

THIS improved mode is applicable to any machine for making the web, or endless sheet paper, so called, and is specified and described as follows:

A sheet, or web of paper is first made in the usual manner, except that it is wound upon a cylinder, or reel, either attached to, or suspended over the machine, above the press rollers, and also above the one ordinarily used as a receiving cylinder, or reel, in making single paper, on machines; and similar in construction, and dimensions thereto, but revolving in an opposite direction.

The upper cylinder, or reel, being fitted, either a lever, weighted strap, or spring, is made to bear on the surface of the cylinder, or reel, or on a pulley attached to it, with weight, or force, sufficient to regulate its motion while the paper is unwound from it; the end of the sheet is then conducted, so as to come in contact with the stuff, or unpressed paper, as it lies in the felt, before it has passed between the press rollers. The double sheet being thus formed, passes between the press rollers, and is wound upon the cylinder, or reel, ordinarily used in making single paper, and is afterwards treated and finished in the same manner as single paper.

On the same principle, paper of any number of thicknesses may be made by removing the lower cylinder, or reel, with the double sheet on it, to the place of the upper cylinder, and the upper cylinder to

the place of the lower cylinder; by conducting the double sheet on to the stuff, or unpressed paper, as it lies on the felt, in precisely the same manner as above described, paper of three thicknesses will be produced: and by repeating the process of thus shifting the two cylinders, or reels, a thickness will be added to the paper at each charge.

RICHARD WATERMAN.
GEORGE W. ANNIS.

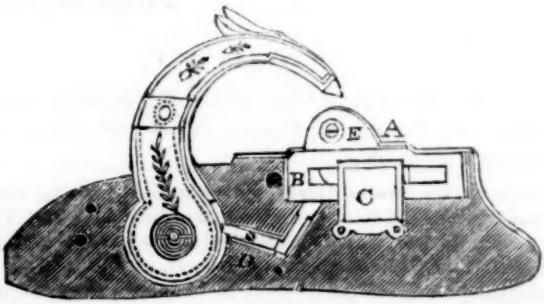
Specification of a patent for a Water-proof, Self-priming, Percussion Gun-lock. By SAMUEL L. FARIES, *Middletown, Butler county, Ohio, August 29th,* 1828.

THE main-spring, bridle, tumbler, dog, and dog-spring, are made, placed, and operate, similar to a common English gun-lock. The cock is of iron, and forms nearly a semicircle, works on the right side, and near the middle of the cock, has a bend, or offset, to the left, so as to make the percussion point strike in the pan. The pan is on the top of the lock, and in a plug, having a bush-screw to enter the right side of the gun barrel, near the breach, and through which bush-screw is perforated a hole, or fuse, communicating with the pan and the inside of the barrel; and set in a square notch, in the upper edge of the plate or side piece, which plate may be brass, iron, steel, or silver, at discretion. On the top edge of the plate, is placed a "priming cap," which may be made of either brass, iron, steel, or silver, nearly semicircular on the top, flat on the underside, having a hole therein, a little forward of the centre, and made to contain a half thimble full, more or less; which priming cap is attached to a plate, having a side plate or slide, which slide has a horizontal aperture in the middle, about an inch long, and one-eighth of an inch wide; this slide and cap are attached together, and kept in their place by means of a bridle, screwed on to the outside of the main plate, and which slide and cap are moved backwards and forwards, by means of a right angled lever confined to the main plate, the angle projecting forwards; to the outside of the upper leg of the angle, is a small and short pivot, placed to run in a groove, which groove is perpendicular on the inside, and near the end of the side plate of the priming cap; the end of the lower leg of the angle is rounded, and placed in a semicircular mortice, near the lower or but-end of the cock, and which right angled lever is confined to the main plate of the lock by a screw, through it, near the middle of the lower leg of the lever. There is also a screw entering the right side of the priming cap, for the admission of priming powder; hence, when the lock is half cocked, the pan is covered; when it is whole cocked, the priming fills the pan, and when the trigger is drawn, the priming cap is drawn back from over the pan, and the percussion point strikes in the pan, and fire is produced. The claim therefore of this applicant is, that he be secured in his invention of the cock, priming cap,

and slide, right angled lever, bridle and plug pan, with the bush-screw attached, as before described, to be used, in connexion with the main-spring, bridle, dog, and dog-spring of a common English gun-lock.

S. L. FARIES.

SAMUEL L. FARIES' PERCUSSION GUN-LOCK.



A. Priming cap.—B. Slide part of do.—C. Bridle.—D. Right angled lever.—E. Screw which closes the hole, by which the chamber is filled with priming powder.

Remarks by the Editor.—There is in the patent office, one of the above locks deposited as a model, by the patentee. It was sent with the chamber filled with priming powder; on essaying it, one hundred and ninety-nine full and perfect explosions were produced, before the contents of the chamber were exhausted. The discharges were certain, there being no failure excepting when the lock was held in such a position, that the priming powder could not fall into the touch hole. The outside dimensions of the semicircular chamber in this lock, are as follows: length $\frac{5}{8}$ of an inch; height $\frac{3}{8}$; depth, scant $\frac{1}{4}$ inch.

Specification of a patent obtained for a newly invented, or discovered mode or art, for the care and rearage of honey bees, being a mode by which the honey may be taken from the hive; and a new swarm separated from an old one, without injury to either. By FRANCIS KELSEY, *Lockport, Niagara county, New York, August* 26, 1828.

FIRST METHOD OF SEPARATING.

FOR the purpose of separating a new swarm of bees from an old one, when sufficiently numerous, 1st. Raise the hive a little, and blow into the hive a small quantity of smoke, (tobacco smoke being preferable,) which renders the bees docile and harmless, so that they may be managed with perfect safety. 2nd. Remove the hive from the flooring, or other place on which it stands—turn it bottom

upwards upon the ground—place over the hive a sheet, or other cloth, and a sufficient thickness of cloths, to render the hive dark; a slight hammering or thumping is then to be made upon the ends of the sticks which run through the hive, which will start the bees from the centre of the hive; the hammering is then to be continued upon and about the hive, near the ground. The bees will, by this means, be driven to the top, and attach themselves to the sheet—the sheet is then to be raised from the centre of the hive; the sheet must be raised from the hive slowly and gradually, and as fast only as the bees will follow it up, the hammering upon the hive to be continued. The bees in 10 or 15 minutes will nearly all be attached to the sheet, when it is to be removed entirely from the hive, and spread upon the ground; one end of the sheet is to be raised upon a block, or other substance, about one foot high. 3d. Place an empty hive upon the raised part of the sheet, on the block; place a few bees near the empty hive, they will run into the hive, and their noise will attract the others. They then are to be allowed to run into the empty hive, until a sufficient portion of them have taken possession of the new hive, and until the queen bee is discovered, if practicable. The bees are to be made to pass into the new hive slowly, by removing the hive a proper distance from them, which affords a better opportunity of discovering the queen bee; they may also be made to go slowly by partly covering them with a cloth. The queen bee may be known by the darkness of her colour, and the brisk movements of the other bees about her, and the slowness of her movements. 4th. If too great a proportion of the bees should have passed into the new hive, the queen is to be taken and safely kept, until the swarm can be separated, and properly apportioned, when the queen bee is to be returned to the new hive. 5th. The remainder of the bees are to be returned to the old hive, where they will provide themselves with another queen bee. 6th. After the swarms are properly apportioned, the hives are to be placed upon their stand, where both swarms will commence the labours of the season.

SECOND METHOD OF SEPARATING.

The hives are to be made of a size, and of wide boards, and about twelve inches square; two sticks are to be placed each way through the centre. Seats are to be put under and near the top board, within half an inch of each other. Some time before the hive shall be filled by a swarm of bees, another hive of the same size is to be placed under it, without a top board, but with seats. The comb will be fastened to the seats. When the lower hive is full, they are to be separated; when the under hive is to have a top board attached to it by cleats; the cleats to run one and a half inches above the side boards, the better to accommodate another hive. This process may be continued from time to time, as may be deemed necessary.

The first of the above methods is preferable. The honey may be taken from the hives by either of the above modes; either by removing a part of the honey, and dividing the bees, as above described; or, by placing all the bees in the new hive, and removing all the honey.

FRANCIS KELSEY.

Specification of a patent obtained for manufacturing entry and carriage mats, from Manilla, Sisal, and other grasses. *By* SAMUEL S. WILLIAMS, *Roxbury, Norfolk county, Massachusetts, August 22nd,* 1828.

THE following is my method of manufacturing entry and carriage mats, from Manilla, Sisal, and other grasses, and hemp, in a common loom. The reed with from five to ten dents to an inch, according to the fineness of the work; the warp of single twine, two threads in a dent; the harness in four shafts, to divide the warp into four equal parts, with four treadles; the weaving is done as follows. Two or three inches of cloth is wove in the usual manner, to secure the end of the mat; one thread of hemp, flax, or tow filling, from one-eighth to one-quarter of an inch in diameter, is then thrown across; (all the above is done with two shafts up, and two down;) one more shaft must now be brought down, which leaves three parts of the warp down and one up; one thread of Manilla, Sisal, or other grass, or hemp, from one-eighth, to three-eighths of an inch in diameter, with just twist enough to hold it together, is then passed through the division of the warp, and drawn up between the threads, and wound round a rod, from one to two inches wide, according to the height the pile may be wanted. (The rod must have a groove in the top, for a guide to the knife in cutting the pile, which is done while the rod is in.) The two shafts that were up when the first thread of large filling was thrown, must now be brought down, and from one to four threads of the same must be wove in, to secure the work, and make room for the next row of Manilla, &c. The same process will be repeated every row, till the mat is the length that is wanted; the last end will be secured the same as the first. The mat is finished by hemming the ends, and shearing the pile.

SAMUEL S. WILLIAMS.

Specification of a patent for an apparatus for the cure of crooked, or inflected spine. Which apparatus is denominated the Dormant Balance. *By* JAMES K. CASEY, *of the city of New York, June 23d,* 1828.

I, THE said James K. Casey, have invented, constructed, made, and applied to use, a new and useful improvement in machines, or apparatus hitherto used, for the cure of crooked, or inflected spine, in the human body, consisting of various instruments, to be denominated the Dormant Balance. The pressure of this Balance is of gradual operation, overcoming the deformity by a firm, but slow, and uniform exertion of its form. It works in a single direction until the irregularity it opposes is overcome, when the power of the machine ceases, and the balance of course becomes dormant. The plane in its inclination may be increased, or reduced, at pleasure, by the pullies; and the straps, and rigid curves, acting in a direction opposite to the

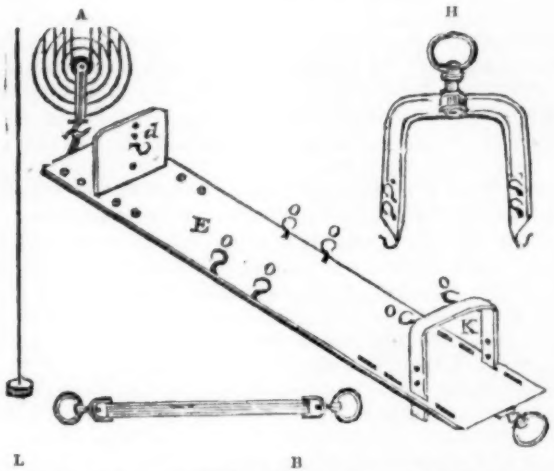
flexure of the bone, have a constant tendency to preserve each successive accession towards a straight spinal column. From a correct construction and application of this apparatus, no pain or injury can possibly accrue to the patient, whose growth, if young, it will greatly aid.

Connected with the Dormant Balance, and of essential importance, is a preparation expressly made for the purpose, to be called the linamentum spinale.

For a minute description of the structure and application of the whole apparatus, I refer to the drawing itself, and the written references, which will be found thereon.

JAMES K. CASEY.

JAMES K. CASEY'S DORMANT BALANCE, FOR THE CURE OF INFLECTED SPINE.



The figure A, is a curve made of brass or steel, to fit or go over the head, fastened at the back in the hooks, and through the holes, by a leather, or strong strap, marked B, and joined by the ring C, to the hook *d*, on the inclined plane E, which, with the patient on it, is raised, or reduced, at pleasure, by the pulley H. The curve K, at the foot of the inclined plane, affords, at the top, a hold to the toes, whilst, at the bottom, the heels pass down, and thus by a slow, but constant and regular gravitation of the body, the curvature of the spinal column is diminished.

The ring L, at the bottom of the inclined plane, is used to raise the foot of the plane, so as to make it swing in the manner of a hammock, by which means an unaltered gravitation is preserved, whilst with the smaller hooks, marked *o*, on the plane and lower curve, the patient is secured in a firm, straight, and direct position, which is necessary to the perpendicular action upon the spine.

The linament is applied by gentle friction to the whole column of the spine, before the patient is placed on the inclined plane, giving energy, as well as elasticity to all the vertebræ of the back bone.

James K. Casey.

Remarks by the Editor.—In the list of patents, p. 137, of the present volume, we noticed the favourable opinion of a gentleman well qualified to judge of the value of this apparatus. This gentleman is a distinguished anatomist and physiologist; and from a careful examination of the principles involved in the action of the apparatus, we think, that very sanguine anticipations of its usefulness, are fully justified.

By a letter from the patentee, we learn that his attention was first led to the subject by the situation of his own daughter, on whose account he had been induced, at an enormous expense, to procure from Europe all the most celebrated instruments, invented for the cure of the disease in question; but they had all fallen far short of the happy contrivance above represented. He is, we believe, now in Philadelphia, attending, with the assistance of his lady, to several male and female patients. Should we hereafter hear any thing interesting on the subject, we will make it known.

On Azure Stone, or Lapis Lazuli, Ultramarine, and the manufacture of Artificial Ultramarine. By the Editor.

The beautiful and costly blue colour, known by the name of ultramarine, has always been manufactured from the rare mineral Lapis Lazuli. But little is known respecting the original geological situation of this stone, as it is found generally in masses of no large size, which have the appearance of having been rolled. A stone resembling Lapis Lazuli, in colour, has been mistaken for it, in several different countries, but it does not appear, by any clear evidence, to have been discovered any where excepting in Tartary, and Siberia. In Europe, it is found only under the ruins of Rome, where it was employed to decorate palaces and temples.

It was formerly believed that Persia furnished the largest portion of Lapis Lazuli, as it was much used in that empire, but it now appears probable, that their whole supply is procured from Great Bucharia, in Tartary. The information given of the manner in which it is there found, is, if correct, very peculiar; it is said not to exist in veins, but to be disseminated in granite in all sorts of proportion, but that it is a rare occurrence to find a mass of six inches in thickness, in which the blue colour predominates throughout. Laxmann, who resided several years in Siberia, says, that rolled pieces of Lapis Lazuli, are found on the shore of the great Lake Baikal; but he was unable to discover, or to learn from the Tartars, any thing respecting the mountain from which these pieces had been detached.

Lapis Lazuli takes a good polish, and is used for various ornamental purposes. It was formerly much employed in the works of the goldsmith and jeweller, particularly as a setting in the tops and

sides of gold boxes and cases, but of late years it has not been fashionable. The most profuse use of it was made by the late empress of Russia, in building a palace at St. Petersburg for her favourite, Orlof. Some of the apartments were completely lined with this costly stone. Those pieces are deemed the most perfect, which are of a uniform, vivid blue colour; and those which have a considerable mixture of quartz, are the least valued. Veins and spots of iron pyrites, of a brilliant gold colour, frequently abound in this stone; which veins are, by the ignorant, mistaken for real gold; for Mosaic, and panel work pieces thus ornamented, are much esteemed; the painted, and other imitations of Lapis Lazuli, have generally followed this kind for their type.

The most extensive use of Lapis Lazuli, in Europe, is in the manufacture of ultramarine; a blue colour, which is at once delicate, pure, and unchangeable. The process followed to obtain this colour, appears to be altogether inartificial, and must undoubtedly have been the result of accident; it is as follows. The stone is made red hot, and then thrown into cold water; after this has been repeated three or four times, it becomes extremely friable, and is to be reduced to an impalpable powder, in an iron, or rather in an agate, mortar. One pint of linseed oil, one pound of bees' wax, one pound of turpentine, half a pound of rosin, and half a pound of mastich, are to be put over the fire, gently heated, and stirred, until the mass is perfectly incorporated. When wanted, a lump of this mass is to be melted, and poured into a warm, clean mortar; one half its weight of the pulverized Lapis Lazuli, is to be incorporated thoroughly with this by means of a pestle; warm water is then to be poured in, and the whole worked about as before; this water when it assumes a dirty appearance is to be thrown away, and a fresh portion added, which will, by continuing the working, become charged with the blue colour; this is to be poured into a clean glass vessel, and the washing and pouring off continued until the extrication of the colour ceases. In a few days the ultramarine settles, and the clear liquor is drawn off.

The colour of ultramarine has been supposed to be derived from oxide of iron. In vol. v. p. 201, we gave a translation of some notices by M. Pajot Descharmes, of certain properties of iron, the last of which is, on '*glass coloured blue by iron.*' The tritoxide of iron being mixed with sulphate of soda, and sub-carbonate of soda, gave to the glass which this mixture produced, a blue colour. The writer suggests, that this fact might lead to the manufacture of artificial ultramarine. In the nature of the thing, there was no known reason why this should not be effected, and men of science have been so convinced of the possibility of the thing, that for four years in succession, the *Société d'Encouragement* of Paris, have offered a prize of 6000 franks for its fabrication.

In the Baron Ferrusac's Journal, for April last, there appeared the following notice. "M. Gay Lussac announced to the Academy of Sciences, at its sitting, on Monday, the fourth of February last, that M. Guimet, inspector of the gunpowder and saltpetre works,

has lately manufactured every kind of ultramarine, and had obtained it, by his process, *of a finer, and more brilliant colour, than the real ultramarine.* It was by following the analysis obtained by MM. Clement and Desormes, that he attained this fortunate result.

"M. Guimet has already sold his ultramarine to the public at twenty-five francs per ounce, (this colour has hitherto always cost from fifty to sixty francs the ounce) and it is expected, that he will be able to afford it at a still more moderate price. The inventer has thought proper to keep his process a secret for the present."

The analysis by MM. Clement and Desormes, which is referred to, is that of Lapis Lazuli, which afforded the following result.

Silica	34.
Alumina	33.
Sulphur	3.
Soda	22.
Loss	8.
	100.

In the *Annales de Chimie*, for April last, another gentleman, M. Gmelin, states that he had been for many months engaged in experiments on the manufacture of artificial ultramarine, in which he seems to have succeeded perfectly, and appears to think that his researches had produced those of M. Guimet, and as he had determined to keep his process secret, M. Gmelin has made public that which he has discovered. The following is a translation of this part of his paper.

"The process by which ultramarine may be prepared with infallible success, is as follows:

"The hydrate of silica, and of alumina, are to be obtained; the first, by fusing well pulverized quartz, with four times its weight of carbonate of potash, and then dissolving the fused mass in water, and precipitating the silica by muriatic acid; the second, by precipitating it from a solution of pure alum, by ammonia. These two earths are to be carefully washed with boiling water; the quantity of dry earth may be ascertained, by heating a certain quantity of the humid earth, to redness. The hydrate of silica, which I used in my experiments, contained 56, and the hydrate of alumina 3.24 parts of anhydrous earth, in 100 parts.*

"As much of the hydrate of silica is then dissolved, as can be taken up by a heated solution of caustic soda, and the quantity of earth dissolved, ascertained. To 72 parts of the anhydrous silica, a quantity of the hydrate of alumina is added, amounting to 70 parts of the dry alumina; the moisture is then evaporated from the mix-

* We have given these numbers as we found them in the original, but there must be some error; well dried hydrate of alumina, consisting of about equal parts of alumina and water. As the hydrate used was humid, the correction should probably be 32.4, instead of 3.24.—[*Editor.*

ture, stirring it constantly, until it is brought to the state of a humid powder.

"This combination of silica, alumina, and soda, is the basis of the ultramarine; but which yet requires to receive its tint from sulphuret of sodium, which is effected in the following manner:

"Into an Hessian crucible, furnished with a good cover, there is to be put a mixture of 2 parts of sulphur, and 1 part of anhydrous carbonate of soda. This is to be gently heated until it is slightly red, and the mass is perfectly melted; into this the former mixture is to be thrown in very small portions at a time, and permitting the effervescence arising from the vapour of water to cease, before a fresh portion is added. After having allowed the crucible to remain in a moderate red heat for an hour, it is taken from the fire, and suffered to cool. It now contains the ultramarine, mixed with an excess of sulphuret, which last is separated by means of water; if there be yet sulphur in excess, this may be driven off by a moderate heat. Should the ultramarine be unequal in colour, the finest and most perfect portion may be separated by washing with water, after having reduced it into a very fine powder."

In a note addressed to M. Gay Lussac, by M. Guimet, on the subject of M. Gmelin's publication, he makes the following observations. "The publication of the process of M. Gmelin, will undoubtedly be advantageous to science; but I much doubt the possibility of procuring the ultramarine by his method, at a reasonable price; of this, time must be the test. For myself, I have the satisfaction of making improvements in my process, daily, and of obtaining, at a diminished expense, ultramarine of the finest quality. I am likely to be able to furnish whatever is required in the arts, having obtained the necessary apparatus, and being aided by an able assistant."

M. Guimet repels the idea of his having derived any information from the inquiries of M. Gmelin. It, in fact, appears pretty evident, that these gentlemen have each discovered a mode of manufacturing ultramarine; but of the similarity of their processes, we have, at present, no means of forming a judgment.

A Notice of some errors in the History of Barker's Mill, as given in Nicholson's Operative Mechanic, and in the Franklin Journal.

TO THE EDITOR OF THE FRANKLIN JOURNAL.

Sir,—Being a constant reader of your valuable Journal, I met, in your number for July last, with the description and history of the mill called Dr. Barker's. About three years ago, my attention was called to the subject, by the account given of that machine in Nicholson's Operative Mechanic; and being at that time about erecting a mill for the purpose of pulverizing drugs, and performing other chemical manipulations, I had thoughts of trying Dr. Barker's. I consulted different books, in hopes of finding more facts relating to its

use in practice: at length I found Dr. Desagulier's Course of Experimental Philosophy, in the library of Harvard College, which is the work to which Nicholson and others give credit, for the first account of this mill; and saw, to my surprise, that the history given of it, and which is copied in the 7th page of your fifth volume, is entirely incorrect, of which you can satisfy yourself by referring to Desagulier's work, Vol. I. page 453, third edition. He states, indeed, that "now by Dr. Barker's improvement, the waste water only from Sir George's ponds, keeps the mill constantly to work;" but the fact is, that the improvement was not the introduction of the mill commonly called Dr. *Barker's*, but merely the *Breast Mill*, with the buckets running in a circular trough, contiguous to the periphery of the loaded quadrant of the wheel. I now quote Dr. Desagulier, omitting only the references to the engraving. "This wheel is 19 feet in diameter, with 12 arms and 24 ladle-boards, and is so contrived, that the ladle-boards receive their water a little above the horizontal diameter of the wheel, and do not part with it till they come to the lowest part of the wheel under the centre, where the water would not only be ineffectual, but hurtful to the motion. The contrivance to effect this, is as follows: there is a circular channel, reaching from the level of the wheel's centre, quite to the under part, exactly square within; that is, the section made through this channel by a plane passing through its wheel's centre, is every where a square of 18 inches the side. The ladle-boards, being 18 inches long and 18 inches broad, just pass down this channel without touching, and scarce lose any water at all (the little that slips by the first, going to the second) in going round a quarter of the wheel," &c. It is by no means strange, that a Breast Mill, of considerable diameter, and adapted to make the most of the water without wasting any, should have been of such signal service to Sir George Savile's ponds.

The true history of the machine that now goes by Dr. Barker's name, may be found in the 459th page of the same volume. Dr. Desagulier says, that "where there is a fall of water, not sufficient in quantity to turn even an over-shot mill; supposing this fall to be of 16, 20, or 30 feet; it is possible to make it turn a new invented mill, the most simple that ever was made; without wheel, trundle, cog, or round. Dr. *Barker* had this thought, and communicated it to me, saying, that it would be an experimental proof of M. Parent's proposition [that an under-shot water mill does most work when the water-wheel moves with only a third part of the natural velocity of the water that drives it.] I took the doctor's hint, and made the following working model of it, which I showed the Royal Society the experiment of, at their last meeting this summer." From the above extracts it appears, that in Desagulier's time, Barker's centrifugal mill had not been tested, except by a working model, and that Barker's *Breast Mill*, did the work for which the former has had the credit. This is not the only instance I have met with, of carelessness shown by the compilers of scientific works, copied by one from another, until it is almost impossible to find with whom the error first originated. The error which I have stated, if not cor-

rected, might induce some person, as it nearly did me, to expend time and money, which might possibly end in disappointment. I have conveniences for trying experiments, and intend, when leisure permits, to try some with the Centrifugal Mill, for which I have made some preparations—the result shall be communicated.

S. C.

Newtown, Mass. Sept. 1828.

Remarks by the Editor.—We are much obliged by the foregoing remarks of our correspondent. We have not Desagulier upon our shelves, but have no doubt whatever of the correctness of the preceding statement. The detection of an error of this kind, is, in our estimation, a thing of no small importance; we have examined several other books, in which the mistake complained of, is propagated, and have not met with one in which the facts have been correctly stated. It has been the determination of the Editor, to write an article upon the subject of Barker's Mill, and if our correspondent will turn to our preliminary remarks, p. 2. in the July number, he will find this intention expressed, and also some opinions given, calculated to discourage the *expenditure of time and money*, on a mill of this description. In the last edition of *Evan's Millwright and Miller's Guide*, which was revised by the Editor, a similar expression of his opinions respecting this mill, may be found.

It is much to be regretted, that in the *art of book-making*, there is, in general, so little industry used, that an error committed by a first compiler, stands a fair chance of perpetual succession, as it is almost sure to be fostered by the next, and the next, and the next in turn. Every man of science has experienced the truth of this to his cost. Whether we should have detected that which has been pointed out by our correspondent, we do not know; the promised article, however, would not have been written without consulting Desagulier's work, as one of the objects which we had in view, was to ascertain the respective merits of Barker, and of Rumsey. The article in our July number, was a continuation of a series of essays from a foreign journal.

We hope S. C. will fulfil his promise.

On the Combination of a Practical with a Liberal course of Education. By W. R. Johnson, *Principal of the High School of the Franklin Institute.*

No. IV.

The description of the interior arrangements, the furniture and apparatus employed in conducting the institution, whose course of study has been already discussed, next claims attention. The importance of convenient accommodations, for the management of a school, cannot be too highly estimated. The duties of government and instruction, which, in the schools of our country, generally de-

volve on the same individuals, are sufficiently arduous, without any additional vexations from narrow, crowded apartments, imperfect ventilation, deficiency of light, or the ill contrivance and bad arrangement of desks and other furniture. The haggard looks of teachers and pupils, subjected to the influence of such circumstances, often testify that these are, literally, affairs of vital consequence.

No profitable exercise of mind, can be expected, where the bodily functions are either suspended or imperfectly performed. It is to be feared that health, and comfort, and the love of learning, are often sacrificed to the cupidity which seeks to make a pecuniary saving, by crowding large numbers into small spaces. These considerations will excuse more minuteness in this description, than the general reader would, perhaps, deem necessary.

Though the apartments, in which the High School is at present held, are by no means the best which could be devised for its accommodation, yet no other equally commodious, have been found, in a situation which would render them, on the whole, desirable. The want of suitable grounds, in the neighbourhood of the building, to admit of gymnastic exercises, is felt as an inconvenience, which ought, if possible, to be remedied, in providing a future location.

To have all departments of the school under the same roof, is likewise important to the interests of the establishment, as it affords an opportunity for more frequent and intimate inspection, by the principal, into the operations of all the classes. A good lot of ground, on which suitable buildings may be erected, with special reference to this object, is a *desideratum.*

The hall of the Institute, in south Seventh-street, of which the third floor is appropriated to the High School, is about 98 feet in length, and, for about twenty feet at the two ends, it is 58 feet in breadth, while the middle portion is narrowed to forty-two. This central portion is, internally, fifty-six feet in length, and forty in breadth, and affords the principal apartment for the accommodation of the school. This apartment is called the *study room.* Of the other two portions, one is appropriated to those pupils who pursue only English studies, and are considered as *preparing* for the regular course. The other is used solely as a *recitation room* for the pupils of the High School department.

Three passages, each six feet in breadth, connect the *study* and *recitation* rooms, and render them essentially one apartment. In the central passage, the master's desk is placed, affording, from a platform elevated about two feet, a view of all the classes, whether at study or recitation. The benches and desks of the study room, are so placed, that the faces of all the scholars are directed to that end where the master's desk is situated. Each desk is three feet eight inches in length, by 18 inches wide, and each bench 3 feet 4 inches long, and 11 inches wide, intended to accommodate two scholars.

Each bench is firmly attached to the front of the desk, immediately behind it; and the whole space from front to rear, occupied by each bench with its desk, is two feet nine inches.

Each desk is furnished with two slates, which are considered part of the permanent furniture.

The passages which run from front to rear, between the ranges of desks, are 17 inches in breadth, allowing every scholar to arrive at his place, without passing behind, or interrupting any other. The central passage has double the breadth of the others, and a space five feet wide, unoccupied by desks, extends around the room near the wall.

In the *recitation room*, are nineteen semicircular benches, each of five feet exterior diameter, and seven inches wide, lengthened, however, by the addition of one foot at each end to the semicircular part. The benches are arranged round the room, the concave part being turned towards the wall, within about 2 feet of which the ends are placed; leaving a passage of that width, quite around the apartment. At each of these semicircles, seven pupils can be conveniently accommodated for recitation, who sit round a small table 20 inches square, facing the centre, where the monitor's bench is placed.

Behind each monitor's bench, a black board, about 4 feet long and three and a half wide, is suspended against the wall, at such a height, that operations performed upon it, may be seen by the teacher in the centre of the room, as well as by all the pupils who sit at the semicircle. In the two feet passage between the range of semicircles and the wall, is a bench, on which a large class is seated when called out for examination or for recitation to a master. In such cases the nineteen black boards are frequently put in requisition at the same time, as the eye of the teacher by passing from one to another, readily detects any error which may occur in the operation to be performed.

Besides these arrangements for recitation, ten semicircles are placed on one side of the *study room*, in the space near the wall, not occupied by desks. In the same apartment, at the end opposite the master's desk, are several cases containing books of reference, and apparatus for different purposes.

For the aid of scholars well advanced in the *languages*, an open book-case is placed in the *study room*, containing an ample supply of dictionaries, among which are Hendericus' Greek Lexicon, Ainsworth's quarto Latin, Johnson's English, Boyer's French, Ludwig's German, and the Academy's Spanish Dictionaries, Crabb's Technological Dictionary, Crabb's English, and Dusmenil's Latin Synonymes, Adam's and Kennett's, Roman, and Potter's Greek Antiquities, Lempriere's Classical Dictionary, and many other books of a similar character.

For the occasional use of students in *elocution*, the works of several eminent writers on the subject, and collections of speeches, and other compositions adapted to the purpose, are placed within the reach of the pupils. Some works in this department are still wanting, which it is hoped may, in due time, be supplied.

In *natural philosophy and chemistry*, the apparatus is already respectable, and for illustration in some particular departments very ample.

The electrical machines, batteries, and other apparatus belonging to this establishment, are believed to be inferior to few collections in the country. A set of electro-magnetic instruments will, in due time, be added. The pneumatic apparatus is, likewise, unusually excellent. A good set of mechanical powers, and a number of astronomical instruments, are still wanting.

The school is furnished with a pair of 9 inch terrestrial globes, suitable to be used by monitors in teaching their divisions, a pair of 18 inch globes, and a third pair, 24 inches in diameter, chiefly used for astronomical problems. It has, on rollers, large maps of the *world*, of the *four quarters*, of the *United States*, *Pennsylvania*, *Western States*, *South America*, &c.; a box of sixty small maps on paste board, by Finley, and a similar collection of ancient maps, by Tanner, besides the elegant American Atlas, by the latter publisher, and the general school atlas, by Morse. Several copies of Worcester's Gazetteer are deposited in the book-case, to be freely consulted by the pupils in preparing their exercises and solving problems. In the department of geography, the above materials, in addition to the text book of the school, have, generally, been found sufficient for all the purposes of the establishment; but some additional volumes for reference, and a few other maps, charts, and atlases, would, occasionally, be useful.

In the department of *drawing*, the school is supplied with a collection of upwards of thirty original patterns, executed by Mr. W. Mason, in Indian ink, on large map paper, each 31 inches in length, by 24 in breadth, and each including some class of tools, implements, furniture, or utensils, represented in bold lines, easily distinguished at the distance of 50 or 60 feet. These constitute a series of exercises in linear drawing, graduated from very simple and easy, to very complicated and difficult.

There is a neat collection of patterns, in the elements of landscape and figure drawing, consisting of about 120, each 12 inches by 8, likewise graduated and numbered, from the easier to the more difficult subjects. Patterns in natural history and architecture will soon be added to these collections.

In the department of *machine drawing*, the models and apparatus belonging to the school, furnish abundant subjects of all degrees of difficulty.

The teachers have supplied themselves with collections of standard works on the subject of education, which are, occasionally, offered for perusal to young teachers and monitors, to aid their practice, and establish their principles in the business of instruction. The journal of the Normal schools of France, the works of Bacon, Comenius, Locke, Dumarsais, Knox, Rollin, and many others, are frequently referred to, either for general hints, or for practical illustrations of the methods of teaching in the several departments.

On a new variety of Borax, (Borate of Soda,) possessing properties which render it valuable in the arts, and particularly to jewellers. Abstracted from a memoir in the *Annales De Chimie*, for April, 1828. By the Editor.

The memoir alluded to in the title, is, in great part, devoted to an examination of the claims of M. Buran and M. Payen, to priority in the discovery of the new variety of borax, which is the subject of this article. This discussion we omit altogether, and proceed at once to give an account of the useful properties, and the mode of preparing the substance in question.

The artisan, for whose benefit we professedly write, frequently complains that we use the terms employed by the scientific chemist, and do not call things by their common names; and perhaps, our present labour may be thought liable to the same objection. We think that it is a sufficient answer to this complaint, to say, that bodies are known to the chemist in forms and states, in which they have no common name, and that there is, therefore, no choice left, but to mention them by the only name which has been given to them, or to leave them unnoticed. In the present instance, as in numerous others, whilst we introduce terms unknown to the generality of our artisans, we furnish him with the means of preparing that which may be of use to him, although we may not instruct him as regards the play of affinities, and the combination of the atoms, which constitute the new substance.

Jewellers, and other fine workers in metal, prepare their borax for soldering, by rubbing it upon a piece of flat stone, generally a slate, with a few drops of water, in order to reduce it into very fine particles. The ordinary borax is apt to crumble at the edges, in this operation, and small fragments thus become mixed with the finer parts, producing not merely inconvenience, but sometimes causing the metal to melt in considerable portions, to the great loss of the workman. Borax in the new form is entirely free from this defect, for, whilst it is not too hard to rub freely upon the stone, it is sufficiently solid and tenacious to prevent the crumbling so much complained of.

The new species of borate of soda, differs chemically from the ordinary kind, in the quantity of water of crystallization which it contains, this being precisely one-half. This difference in its chemical constitution, is accompanied by corresponding differences in its other properties. Instead of crystallizing in the form of a prism of four or six sides, it assumes that of a regular octahedron. Its density is very much increased, and there is a similar augmentation in its hardness. The common, or prismatic borax splits in pieces when exposed to a temperature of 120°; the octahedral remains solid when thus exposed. Common borax retains its transparency in a moist atmosphere, or when immersed in water, whilst in a dry air, it becomes opaque, in consequence of its effloresecing on its surface. The new kind, on the contrary, becomes opaque when affected by moisture,

but remains transparent in a dry situation. To the chemist, the cause of these differences needs no explanation.

The following is the mode of obtaining the octahedral borate of soda, practised by M. Payen. Borax is dissolved in water at the boiling point; the quantity dissolved should be such as will give to the boiling hot liquid, a density of 30° of the hydrometer of Beaumé, which is equal to a specific gravity of 1.26. This will probably require 7 or 8 parts of water to 1 of borax; this, however, is a mere guess, as we have not made any certain experiments, or calculations on the subject. The solution is then allowed to cool quietly and slowly; when it has descended to nearly 170°, it will begin to deposit the octahedral crystals, and will continue so to do, until it arrives at 132°. At this point, the uncrystallized liquid, or *mother-water*, must be poured off. If this be not done, the whole operation will fail, as the octahedral crystals will become coated, and united, by borax in the ordinary state, which is deposited as the liquid descends to a lower temperature.

The process of M. Buran differs somewhat from the foregoing, and is calculated only for operations in the large way. His solution is made rather more concentrated, being equal to 32° of Beaumé's hydrometer, or about 1.28 sp. g. He then covers the boiler, so as to cause the solution to cool as slowly as possible. If operating upon 1000lbs. of borax, it is allowed to remain about 6 days, when it is opened, the liquid drawn off, and the mass of borax taken out. The crust which was last deposited, is of the prismatic kind, this is detached by means of a hatchet, from the dense deposit of octahedral borax.

The new kind of borax is intrinsically of much greater value than the ordinary kind, leaving its utility in the arts out of the question. This will be readily understood, when it is known, that the water of crystallization in the latter, amounts to nearly 50 per cent., whilst the former contains but half this quantity. Under the same weight, therefore, we are presented with a much larger quantity of borax.

In presenting the two processes to our readers, we have, in the first, offered to the jeweller the information necessary to enable him to operate upon a small quantity for his own use; and by the second, the manufacturer may supply the market with an article which will always be preferred, where its superiority is known.

Description of a new parallel motion for Steam Engines, with observations on the advantages which it possesses over those in ordinary use. By URIAH BROWN, *Mechanical Draftsman, Washington City.**

TO THE EDITOR OF THE FRANKLIN JOURNAL.

SIR,—Should the subjoined description and investigation be thought worthy of publication in your journal, you will gratify me by insert-

* Mr. Brown has deposited his description in the Patent Office, for the purpose of obtaining a patent; this will account for the style of the communication.

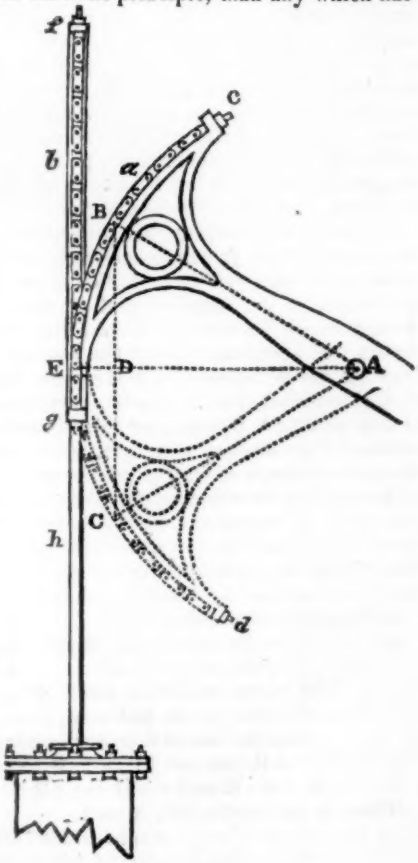
ing it. I believe that the plan is new, as I have examined several of the most esteemed publications on the subject of the steam engine, but have not seen described any parallel motion bearing a nearer resemblance to it, than the rack and segment, which, from its great friction, has been necessarily abandoned.

Yours, &c.

URIAH BROWN.

Washington, D. C., Sept. 10th, 1825.

The proposed improvement, I denominate "The Double Tangent Chain Lever;" the object of which, is to transmit motion and power from the piston to the lever or working beam of steam engines, and to convert the rectilinear motion of the piston, into a reciprocating circular, or a continuous circular motion, and, as I believe, upon a more simple, economical and efficient principle; than any which has been heretofore suggested.



This object, I propose to accomplish, by means of two chains, (*a* and *b*,) alternately working over the periphery of an arc at the extremity of the impelled end of the lever. The chains are formed similarly to the common watch-chain, and are each to be secured, by one end, to projections, (*d* and *c*,) at the extremity of the two opposite ends of the arc, by means of regulating screws and nuts; and by the other ends, to opposite vertical points, (above and below the arc,) of the cross bars, (*f* and *g*,) of an open parallelogram sliding frame; into the centre of which, directly over the piston-rod (*h*) with which it is connected, the periphery of the arc projects, and in which it oscillates freely. The chains lie parallel with each other and with the motion of the piston, from the two opposite points, where they are inserted into the cross-bars of the slide,

till they meet, or pass each other, at a tangent point (E) of the arc, horizontal to the fulcrum (A) of the lever; from this point, they follow the periphery of the arc to its opposite extremities (*c* and *d*,) and upon which they act as the agents of communicating motion and power from the piston to the lever, and the parts with which it is connected, by alternately elevating and depressing it; that is, by the upward stroke of the piston, the lever is moved from C to B, and by the downward stroke, it is returned again to C.

The advantages which I contemplate may be derived from this modification, are, the saving of that portion of the power of the engine, which is lost by the present methods of communicating motion to the lever, by the angle which the connecting rod makes with the piston-rod, and the lever, at the upper and lower points, (B and C,) and by the great degree of friction, which, consequently, unavoidably occurs, even in the most approved principle which has yet been adopted for preserving a parallel motion in the piston. This saving of power is effected, by reason of the chains working uniformly at a stationary tangential point (E) of the periphery of the arc; the *maximum* force of the engine being thereby constantly exerted at *radius*, and the chains rolling alternately on and off the arc, at the horizontal point (E,) maintain a perfectly uniform parallel motion in the piston, with no other friction than that which is occasioned by the slight working of the rivets in the connecting joints of the links.

In order to illustrate this proposition, and to show the decided superiority of the principle here suggested, over that of the lever in common use—in reference to the common lever, put radius A E = the length of the impelled end of the lever A B; and the sector through which the lever oscillates, from B to C, and *vice versa* = 60°; that is, 30° above and below the radius, or horizontal line A D E. Now, as the piston-rod (*h*) moves in a tangent line to the radius A E, it is manifest that the motion communicating power to the lever, at any point, (A B) must be in a direction parallel to the tangent motion of the piston; therefore, at any point, (E) less than radius, the space through which the power moves, must be as the right sine of the angle of elevation or depression in the lever, and in that direction only; consequently, the efficient force which is exerted upon the lever in common use, at every increscent or decrescent point less than radius, is as the co-sine; and the power lost (or ineffectually exerted) as the versed-sine of the angle of elevation or depression.

Putting R = the radius A E;
v = the versed sine D E,
c = the co-sine A D,
} of the triangle A B D and A C D.

M = the maximum power exerted at E = R;
l = the power lost = v; and
r = the residual power exerted = c,

it is, M : l :: R : v; and M : r :: R : c; or, transposing it,
l : M :: v : R and r : M :: c : R.

Then, at an $< 30°$, if R is = 1.
v is = .1339746, and
c is = .8660254.

Putting M = the power of 100 horses, it is,

$\overline{M=1} : \overline{l=.1339746} :: \overline{M=100} : \overline{l=13.3974600}$, the horse power lost, and $\overline{M=1} : \overline{r=.8660254} :: \overline{M=100} : \overline{r=86.6025400}$, the residual horse power applied. But, as this extent of versed sine, and its consequent proportionate diminution of power, is only of momentary duration, on the alternation of motion at the extreme zenith and nadir points (B and C,) the mean between these two points, and the horizontal point (E,) at which the *maximum* energy of the power is exerted, must be taken as the average loss of force sustained by the common lever—viz. equal to the versed sine of a fraction more than 21°,=6.6987300. Pursuing, then, the equation, and putting M = the mean loss of power at the versed sine of 21°, &c. we have,

$\overline{l=13.3974600} - \overline{M=6.6987300} = \overline{l=6.6987300}$, the average horse power lost; and

$\overline{r=86.6025400} + \overline{M=6.6987300} = \overline{r=93.3012700}$, the average horse power exerted. From which, it appears, that the average loss of power, on the common lever, ranging through a space of 60 degrees, is equal to 6.69, &c. per cent.; and the average power exerted, equal to 93.30, &c. per cent. of the maximum power of the engine.

To this loss may be added, that arising from the friction which occurs, in maintaining a parallel motion in the piston, particularly when the connecting rod is at its greatest angle with the piston rod, and the lever, at the upper and lower points (B and C;) at the very points, too, where friction is interposed to the greatest possible disadvantage of the engine; for, it is at the very instant, when the efficient power on the lever is at its *minimum*, and when the crank at the end of the antagonist lever is at its *dead point*, and when, consequently, there is no efficient power exerted upon it, except that which has been previously communicated to the fly-wheel, and by the *vis inertia*, alone, of which, the engine is relieved from the mechanical dilemma in which all these causes have conspired to place it. The power which is thus lost, by friction on the machinery necessary to maintain a parallel motion in the piston, and its injurious effect upon the crank motion, may, perhaps, be fairly assumed to equal the average loss of power on the lever, as before stated, viz. =6.6987300; which, added to 6.6987300, (the average loss on the lever) is=13.3974600, the whole amount of horse power lost; equal to 13.39 per cent. of the maximum power of 100 horses. Consequently, an engine, of the form in common use, computed to be equal to the power of 100 horses, is actually only equal to one of 86.60-100, &c. constructed upon the principles here proposed.

It may, perhaps, be urged as an objection to the proposed improvement, and as an argument in favour of the present form of steam engines, that it is unnecessary to work the piston through so great a range of stroke; or, if this should be requisite, a corresponding length of lever may be employed, which would lessen the angle of the connecting rod here mentioned. I am aware that this may, in some instances, be practicable; but I am equally aware, that just in proportion as the length of the stroke is reduced, will the recurrence

of passing the crank through the *dead points* of its circle be increased—a circumstance which ought carefully to be avoided, as far as practicable, by all engineers. A great length of lever is often attended with serious disadvantages; particularly in its application to steam-boats; where, for want of room and other circumstances, the lever, and, consequently, the length of the stroke, are circumscribed to small ranges; and the frequent return of the crank to the *dead points*, and the consequent *diminution* of power, is the result. But, admitting the length of the lever and the stroke to be indefinitely increased, the difficulties, before suggested, will, thereby, be only partially, but never entirely, overcome; whilst other equally serious ones, are produced by the ponderous weight and increased expense of the lever, and the parts with which it is connected.

It is obvious, from an inspection of the principle here proposed, that a great range of the piston is practicable, with a very small leverage, and that, consequently, the disadvantages incident to the common lever could be obviated by its adoption. Another consideration of no small practical importance in favour of the plan here proposed, is, its *simplicity*, and consequent less liability to get out of order, and the ease and facility with which the parts can be adjusted, if they become in any way deranged. A man with a wrench, can, in a few minutes, perform this operation, whereas, upon the present plan, it often requires the labour of a number of men, for several hours, to adjust, properly, all the nice and intricate parts, connecting the lever with the parallel motion of the piston.

This principle is intended to apply equally to the connexion of the lever with all the pistons, appertaining to a steam engine; and to all other machines, where a rectilinear motion is to be converted into a reciprocating circular, or a continued circular motion.

I do not pretend to be the inventer of the chain, nor the first to have suggested the application of it *singly*, to the working of the Steam-Engine. Messrs. Savary, Brighton, Watt, and others, having, many years since, applied a *single* chain to their atmospheric and single-acting engines, where a rectilinear motion was only required, and the use of which was, no doubt, discontinued by them, from their not having perceived the extended application of the principle to produce a rotary motion, at the time that steam engines began to be employed as a power for general manufacturing purposes. Nor do I claim to be the discoverer of the adaptation of chains to machines where a reciprocating rotary motion is to be converted into a reciprocating rectilinear motion; chains having been already employed for this purpose, in the construction of fire-engines, &c. What I claim as my invention or discovery, is the adaptation of *two* chains, as before described, to effect a reciprocating, or a continued circular motion, in steam-engines, and in other machines. U. B.

List of Patents for New Inventions, which passed the Great Seal, from April 26th, to June 3d, 1828.

To William Marshall, shear manufacturer, for his invention of improvements in machinery for cutting or shearing, cropping and finishing cloth and other articles, manufactured from wool or other raw materials—April 26.

To Thomas Briedenback, merchant, for his invention of a machine, or improved mode by use of machinery, for forming or manufacturing tubes or rods, and for other purposes—April 26.

To James Griffen, scythe manufacturer, for his invention of an improvement in the manufacturing of scythe backs, chaff knife backs, and hay knife backs—April 26.

To John James Watt, surgeon, for his discovery, by the application of a certain chemical agent, by which animal poison may be destroyed and the disease consequent thereon effectually prevented. April 29.

To Charles Carpenter Bombas, Esq. for his invention of improvements, in the propelling of locomotive carriages, and machines, and boats, and other vessels—April 29.

To Thomas Millman, mast maker, for his invention of certain improvements in the construction and fastening of made masts—May 1.

To Jonathan Brownill, cutler, for his invention of an improved method of transferring vessels from a higher to a lower level, or from a lower to a higher level on canals; and also, for the more conveniently raising or lowering of weights, carriages, or goods, on rail roads, and for other purposes—May 1.

To James Palmer, paper-maker, for his invention of certain improvements in the moulds, machinery, or apparatus for making paper—May 6.

To Thomas Adams, manufacturer, for his invention of certain improvements on instruments, trusses, or apparatus for the relief, or cure of hernia or rupture—May 6.

To Francis Westley, cutler, for his invention of certain improved apparatus to be used for the purpose of whetting, or sharpening the edges of the blades of knives or other cutting instruments—May 6.

To Samuel Brooking, Esq. a rear-admiral in our royal navy, for his having invented a certain turning or shipping fid for securing and releasing the upper masts of ships and vessels—May 6.

To Matthew Fullwood, junior, gentleman, for his invention of cement mastich or composition, which he intends to denominate German cement—May 6.

To John Benjamin Macneil, engineer, for his invention of certain improvements in preparing and applying materials for the making, constructing, or rendering more durable, roads and other ways, which materials so prepared are applicable to other purposes—May 6.

To Thomas Jackson, watch-maker, for his invention of a new

metal stud, to be applied to boots, shoes, and other like articles of manufacture—May 13.

To John Ford, machine-maker, for his invention of certain improvements in machinery for clearing, opening, scribbling, combing, slubbing, and spinning wool, and for carding, roving, or slivering and spinning cotton, short stapled flax, hemp, and silk, either separately or combined; and for spinning or twisting long stapled flax, hemp, silk, mohair, or other fibrous substances, and either separately or combined—May 13.

To Thomas Bonsar Crompton, paper-maker, and Enoch Taylor, millwright, for their invention of certain improvements in that part of the process of paper-making, which relates to the cutting—May 13.

To Charles Chubb, patent lock manufacturer, for his invention of certain improvements in the construction of latches, which may be used for fastening doors and gates—May 17.

To Thomas William and John Powell, glass merchants and stoneware manufacturers, for their invention of certain improvements in the process, machinery, or apparatus, for forming, making, or producing moulds or vessels for refining sugar; and in the application of materials hitherto unused in making the said moulds—May 17.

To Thomas Aspenwall, Esq. in consequence of a communication made to him by a certain foreigner residing abroad, for an improved method of casting printing types, by means of a mechanical process, which invention he proposes to call the mechanical type caster—May 22.

To Samuel Hall, cotton manufacturer, for his having invented or found out a new method of, and an apparatus for, generating steam and various gasses, to produce motive power, and for other useful purposes—May 31.

To James Moffat, master-mariner, for his having invented an improvement in apparatus for stopping and securing chain cables, also for weighing anchors attached to such chain or other cables, either with or without a messenger—June 3.

To Daniel Jobbins, millman, for his having invented an improved method, by certain machinery applicable to stocks or fulling machines, for milling and scouring woollen cloths and other fabrics requiring such process—June 3.

LIST OF FRENCH PATENTS

Granted in the third quarter of the year 1827.

(Concluded from p. 216.)

To Courtois, Jacques Antoine, builder, for improvements in making tiles, and the manner of fixing them—15 years.

To Mrs. Widow Susse, of the family of Aglae, Reine, Aube, engraver, Paris, for a method of engraving and marking all kinds of drawings, &c. upon skins and leather—10 years.

To Dupon, Jean Pierre, merchant, Paris, for an apparatus for heating and lighting houses by means of hydrogen gas, called the *Chimenee gazofumivore*—15 years.

To Noziet, Louis, clock and watch maker, Tours, for a machine by which the pendulum of clocks can adjust itself—5 years.

To Duport Union, merchant, Paris, for jointed clogs—5 years.

To M. Pierrou, architect, Paris, for an autographic press—5 years.

To Ratcliffe, Thomas, iron founder, Paris, for a mechanical needle for spinning and twisting wool, silk, cotton, hemp, and flax—5 years.

To Godain, Jean Marie Theodore, hair dresser and perfumer, Paris, for a lotion called the *Creme des Lybarites*, for dying the hair —5 years.

To Luzier, Jean Jacques, gunsmith, Paris, for a method of producing two discharges from one barrel, either by percussion or flint—10 years.

To Picqueuer, Onesiphon, mechanic, Paris, for a new system of towing vessels—10 years.

To Messrs. Blanc and Conville, Paris, for improvements in the use of steam engines in drawing off or raising water—15 years.

To Poupart, Abraham, manufacturer, Sedan, for the invention of cylinders, with metallic blades, for cleaning, carding, and combing wool, &c. and instead of thistles, in the napping of cloth—15 years.

To Messrs. Thebes, uncle and nephew, merchants, Forbes, for a method of bruising all sorts of oily grain—15 years.

To Messrs. Provost and Co., Paris, for a mode of giving constant publicity to all acts, advertisements, &c.—5 years.

To Egg, Joseph, merchant, for a self-priming percussion gun—10 years.

To Egger, upholsterer, Paris, for improvements in making moveable tents—5 years.

To Morize, Jean Baptiste, cutler, Paris, for a pair of shears, with machinery for regulating the length to be cut, called *cisoir de proportion*—5 years.

To De la Roche, stove manufacturer, Paris, for an apparatus to be used instead of dogs in chimneys, and to supply the place of vent holes—5 years.

To Curreau, Noel Andre, Paris, for a mill for grating or grinding salts—5 years.

To Veret, Joseph Brionne, Eure, for a machine for stretching wool—5 years.

To Brouillet, Louis Francois, Paris, for a distilling apparatus—5 years.

To Lantieres, Pierre, silk weaver, Lyons, for a machine for making the warp of silk—10 years.

To Messrs. le Comte, Reil, and Pichon, Paris, for a rotative machine, moved by steam—10 years.

To Godart, Jean Baptiste, Amiens, for a machine for peeling hemp and flax, with or without previous steeping—15 years.

To Messrs. Nezy Viry, and De Cormeille, Paris, for an apparatus called the *fumi comburateur*, for consuming smoke and all its hurtful particles—10 years.

To Vaughan, George, engineer, Paris, for improvements in steam-

engines, whereby the force is augmented, and the expense diminished—10 years.

To Joanne Brothers; Mouzin, Philibert; and Lecomte, Eugene, Dijon, for a machine for causing boats to sail up a current by the impulse of the water only, and which may be applied to land carriages by means of using steam—15 years.

To Muller, Charles Francois, Paris, painter, for a mechanical desk—5 years.

To Willer, Jean Charles Guillaume, surgeon, Paris, for a lotion, called *Eau d'Hebe*, for removing freckles—5 years.

To Poisson, Louis Pierre, Paris, for a process of making paper and pasteboard, of liquorice root—5 years.

To Garat, Joseph Dominique Febry, Paris, for an extra clog or shoe, called a *paracrotte*, for guarding the feet and legs from damp and dirt—5 years.

To Caire, Jean Alexis, Paris, for a machine with a swivel, for corking bottles—10 years.

To Marquis de Saint Croix Molay, Pierre Hyppolite de la Poterre, Paris, for the invention of moveable metallic arches, or metallic portable siloes—15 years.

To Messrs. Brian and De St. Leger, Paris, for a process for making hydraulic artificial lime—15 years.

To Dalton, Samuel, Paris, for a method of making silk, cloth, and other buttons, without seams, by machinery—5 years.

To Causon, Brothers, paper makers, of Armonay, for a method of sizing paper—15 years.

To Beaudouin, Jean Baptiste, Paris, for a sub-marine navigation—15 years.

To Houzeau, Nicolas, Paris, for a method of lighting by portable gas—5 years.

To Harmey, Joseph, Paris, for a method of using carding machines by hydrostatics—5 years.

To Lavand, Antoine, writing master, Perigueux, Dordogne, for a method of teaching four kinds of writing in twenty lessons, and ten in sixty lessons. This valuable system is called the *Calligraphie Francoise*—5 years.

To Durant, Nicholas Felix, Chalons-sur-Marne, for a new invented coffee pot—5 years.

To Tregnet, Vincent Pluvoise, piano-forte maker, Paris, for a piano with isolated sounding board—10 years.

To Joannis, secretary to the board of health, Paris, for a method of purifying metals, minerals, cast iron, and metals in general, used in casting—15 years.

To Proust, Alexis, Rochelle, Charente, for a distillery and apparatus—5 years.

To Revillon, Thomas, clock and watchmaker, Macon, Soane and Loire, for sundry improvements in striking the hours of public and private clocks—10 years.

Erratum.—In p. 202, (last number) line 15 from the top; for *or sound*, read *on sound*.